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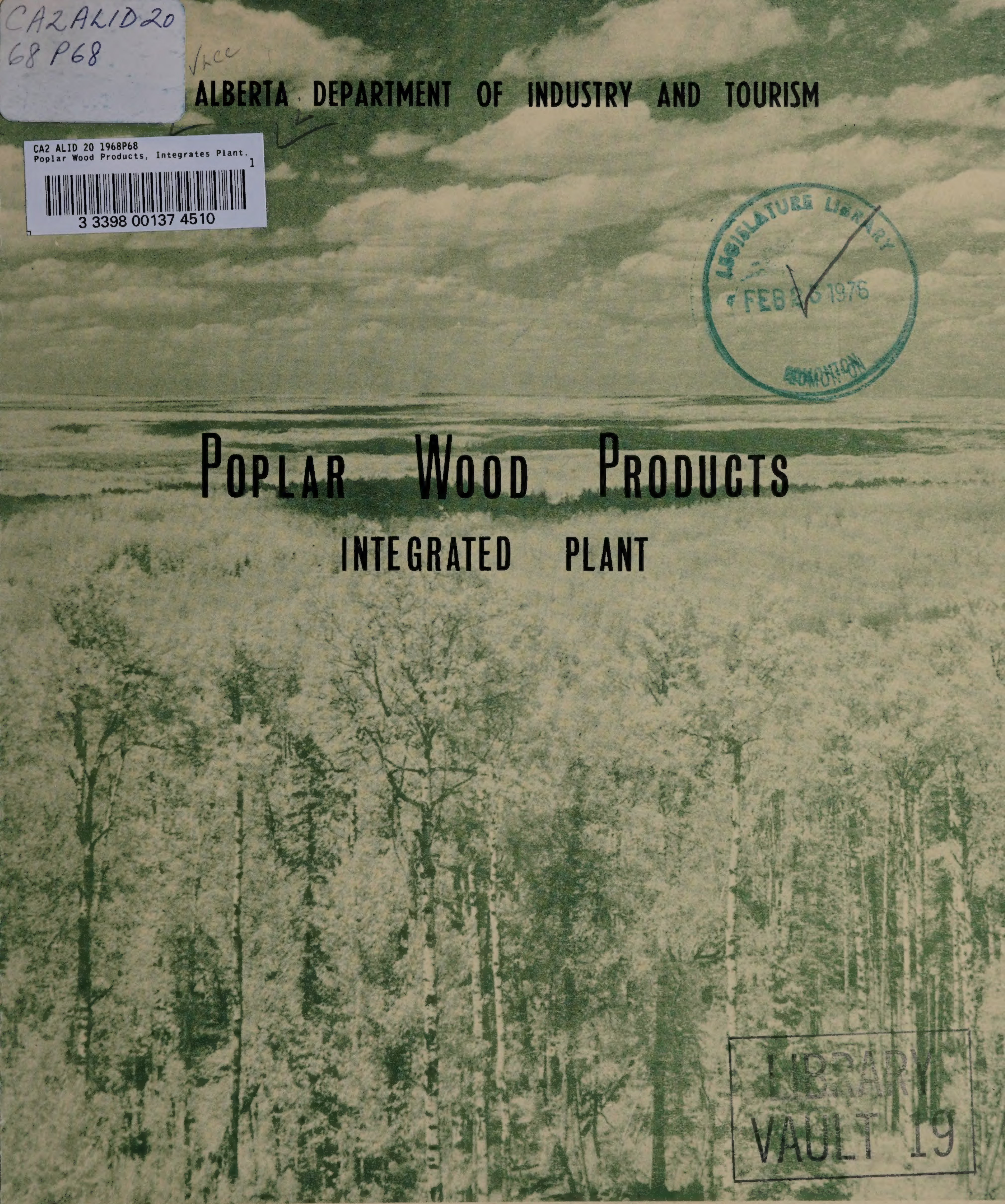

ALBERTA DEPARTMENT OF INDUSTRY AND TOURISM

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UNDERWOOD McLELLAN AND ASSOCIATES LIMITED

Associate Consultants:

INDUSTRIAL FORESTRY SERVICE LIMITED

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UNDERWOOD McLELLAN & ASSOCIATES LIMITED
CONSULTING ENGINEERS - TOWN PLANNERS
LAND SURVEYORS
2540 KENSINGTON ROAD N.W., CALGARY, ALTA. TELEPHONE 283-4961 TELEX 038-2465

April 10, 1968

Director, Alberta Bureau of Statistics,
Department of Industry and Tourism
Room 1529, Centennial Building,
EDMONTON, Alberta.

Attention: Mr. D. I. Istvanffy

Dear Sir:

Re: Alberta Poplar Wood Study

We take pleasure in enclosing herewith our report titled "Poplar Wood Products, Integrated Plant". This is our third report with respect to the Alberta Poplar Wood Study. The report was prepared under the direction of Mr. R. H. Drysdale, P. Eng. of Underwood McLellan & Associates Limited, assisted by Mr. Jack Beach, our economist, and by Mr. R. W. Pearson of Industrial Forestry Services Ltd. of Prince George, B.C.

We have appreciated the opportunity of working with the Committee and express our thanks for its valuable guidance.

Yours very truly,
UNDERWOOD McLELLAN & ASSOCIATES LIMITED

Per: DM Hornby

D.M. Hornby, P.Eng.
Vice-President

DMH:nmb
Enc.

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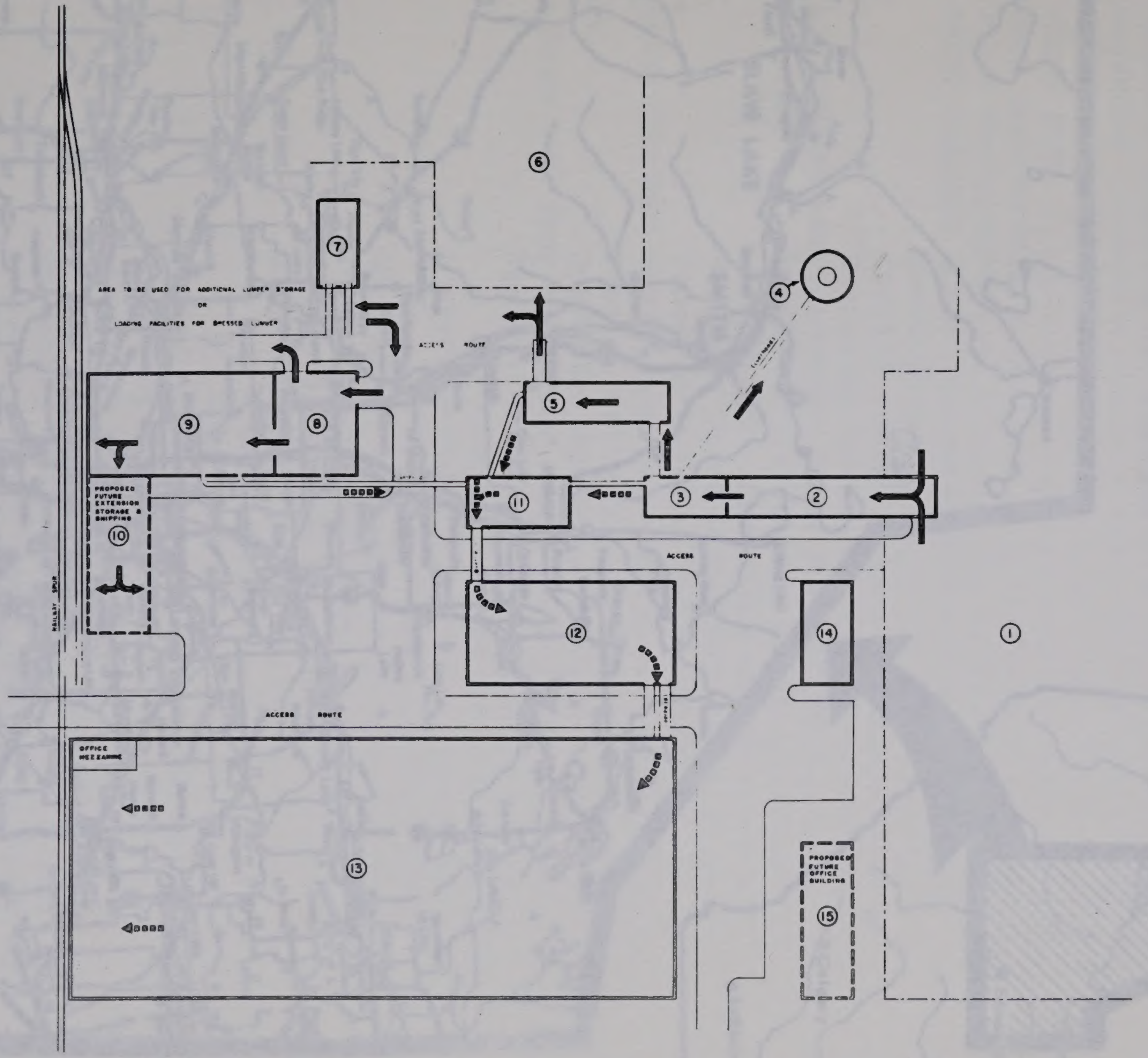
POPLAR WOOD PRODUCTS

INTEGRATED PLANT


⑥
⑦
④
AREA TO BE USED FOR ADDITIONAL LUMBER STORAGE
OR
LOADING FACILITIES FOR DRESSED LUMBER
ACCESS ROUTE
⑤
⑨
⑧
PROPOSED FUTURE EXTENSION STORAGE & SHIPPING
⑩
⑪
③
②
ACCESS ROUTE
RAILWAY SPUR
⑫
⑭
①
ACCESS ROUTE
OFFICE MEZZANINE
⑬
PROPOSED FUTURE OFFICE BUILDING
⑮

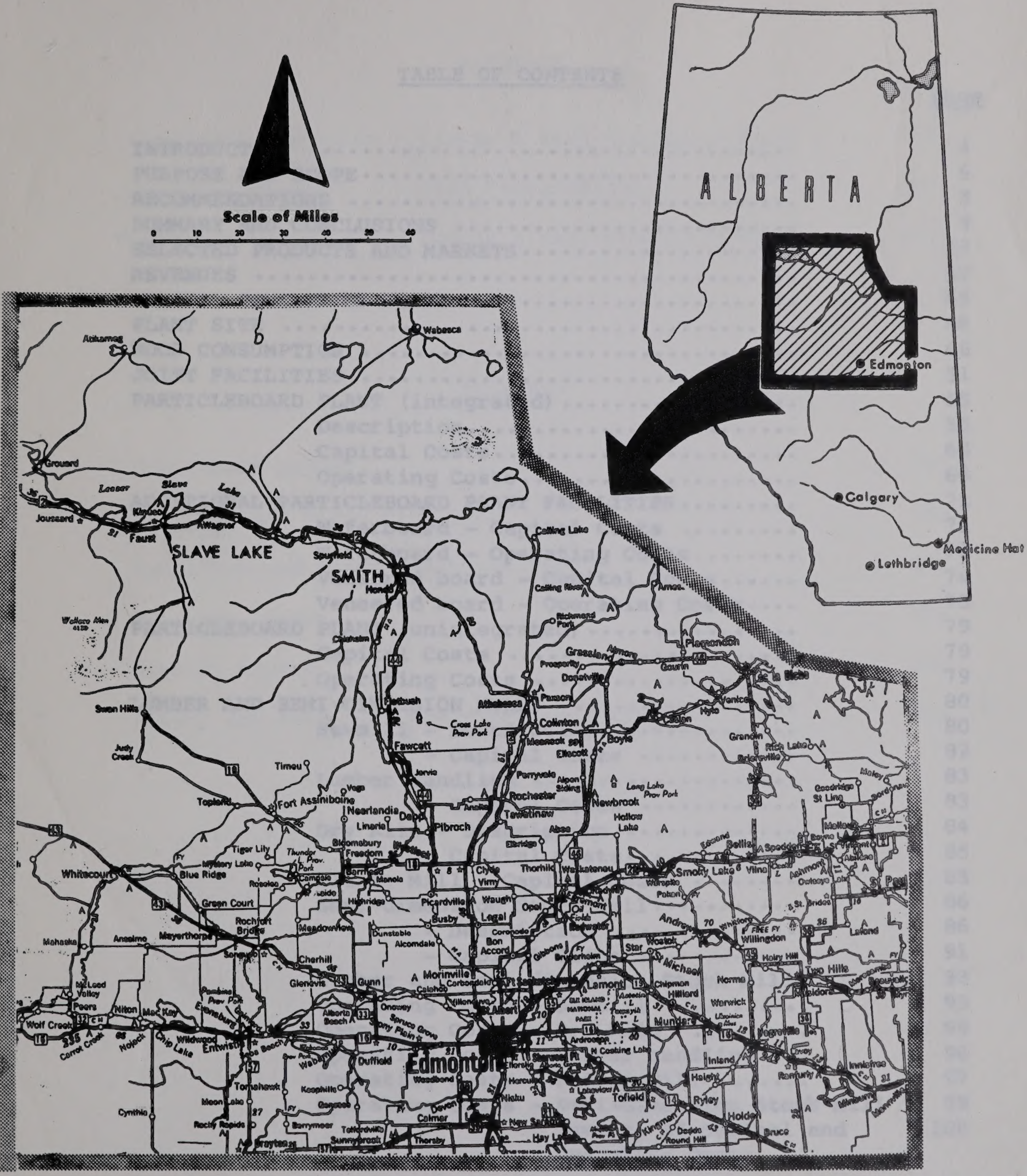
① LOG STORAGE
② LOG POND
③ DEBARKER
④ BURNER
⑤ SAWMILL
⑥ ROUGH LUMBER STORAGE (OPEN AIR)
⑦ DRY KILN
⑧ PLANER
⑨ COMPONENT MANUFACTURING (PRODUCTION & STORAGE)
⑩ POTENTIAL EXPANSION OF STORAGE AREA & ADDITIONAL LOADING FACILITIES FOR RAIL OR TRUCK (FUTURE)
⑪ CHIPPING PLANT
⑫ CHIP FLAKING, CLASSIFYING & DRYING
⑬ PARTICLE BOARD PRODUCTION, FINISHING & STORAGE
⑭ MAINTENANCE
⑮ GENERAL OFFICE (FUTURE.)

NOTE – buildings shown with solid lines are included in analysis of feasibility study.

GOVERNMENT OF THE PROVINCE OF ALBERTA
ALBERTA DEPARTMENT OF INDUSTRY & DEVELOPMENT

PROPOSED LAYOUT OF
POPLAR WOOD PRODUCTS COMPLEX

Industrial Forestry Service Ltd. —— Prince George B.C.
Underwood McLellan & Associates Ltd. —— Edmonton Alberta.
DATE DRAWN – MARCH 10, 1960
DATE REVISED –
DRAWING No. – 2-8-1471



MAP of STUDY AREA

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INTRODUCTION

In April, 1967, a Committee selected by the Alberta Department of Industry and Tourism appointed Underwood McLellan & Associates Limited of Edmonton in association with Industrial Forestry Services Ltd. of Prince George, B.C. to undertake a study of poplar wood products and markets. The purpose of the study was to determine individual products which could be manufactured from poplar resources of Alberta and marketed at a profit.

The study was carried out in 5 phases. Phases I and II included a statistical and market survey on products made from poplar wood. Two reports were submitted covering these first two phases and were titled "Poplar Wood Products Market Survey" dated July 17, 1967, and "Poplar Wood Products Supplementary Survey and Report" dated October 27, 1967. Phases III and IV examined the economic feasibility of producing in Alberta, the most promising products identified in Phases I and II. Phase V related to a plan of action for the further development and production of poplar products in Alberta and has been included in the report along with phases III and IV.

Phases I and II generally concluded that the opportunities

for high value poplar products were restricted to certain manufacturing centres in the furniture and fixtures manufacturing industry. The largest current opportunity for poplar production in this industry was found to be in the Lake States region of the United States.

After a study of the market reports of phases I and II, the committee instructed the consultants to examine, in phases III and IV, the feasibility of establishing an integrated poplar wood products plant which would produce graduated particleboard, waferboard and kiln dried semi-dimension stock.

Based on recommendations of the Alberta Department of Lands and Forests, the area immediately north and east of Lesser Slave Lake was considered most suitable as the source of wood supply. With this area in view, the calculations in the report were based on Slave Lake and Smith as possible sites for the processing plant.

Based on the location and reported density of the timber stands and the accessibility, the Committee and the Consultants agreed, that for purposes of this report, the cost of rough poplar wood delivered to the plant site would average out at $15.00 per cord.

PURPOSE AND SCOPE

The purpose of this report is to determine the feasibility of establishing an integrated poplar wood products plant which would produce graduated particleboard, waferboard, kiln dried planed poplar lumber and kiln dried semi-dimension furniture parts at Slave Lake or Smith, Alberta.

The report includes a summary of the available market for particleboard, waferboard and semi-dimension poplar parts for the furniture industry; the manufacturing processes; the equipment required; the buildings and other items of a capital nature; the layout of the plant; the initial fixed capital and working capital requirements; labour and material requirements; plant supervision and other administrative requirements; the cost of production; plant overhead including insurance taxes, depreciation, etc; the cost of delivering the product; sales revenue; estimated profit or loss; estimated break-even point; cash flows; the profitability of the project; recommended action by the Government directed towards establishing the project.

Layout, design plans, or flow charts included in the report are intended as guides to arrive at estimates of costs. Prices for buildings, equipment and installations are given as estimates.

ACKNOWLEDGEMENTS

We wish to express thanks to the many individuals and companies who contributed valuable, practical information used in the preparation of this report.

RECOMMENDATIONS

With a view to establishing an integrated plant at Slave Lake or Smith, Alberta to produce poplar wood products, it is recommended that:

The Alberta Government develop detailed information on the poplar timber stands located east and north east of Slave Lake.

The Alberta Government utilize every practical means to establish the proposed poplar wood products integrated plant through private industry.

SUMMARY AND CONCLUSIONS

(a) Summary

The study investigated in considerable depth the feasibility of establishing an integrated plant which would take advantage of the extensive poplar wood stands located to the East and North East of Lesser Slave Lake. Although the investigation was based on locating the plant on a railway spur adjacent to the Town of Slave Lake, the conclusion section of this report indicates the effect on profitability of locating the plant adjacent to the railway at Smith, approximately 65 miles east of Slave Lake. It was assumed that for either location an adequate quality of poplar wood could be delivered to the plant at a cost of $15.00 per rough cord.

The integrated plant allowed for the basic production of a graduated type particleboard and the production and processing of kiln dried and planed lumber into semi-dimension stock directed to the furniture industry. Provision was also made for the added production of wafer board and the wood veneering of particleboard.

The fixed capital and operating costs used in the report allowed for equipment of a capacity which would produce no less than 32,700,000 square feet 3/4 inch basis of particleboard and 2,000,000 fbm. of semi-dimension stock. The initial production levels of 2 m.m. fbm. of semi-dimension stock and 32.7 m.m. sq.ft. 3/4 inch basis of graduated particleboard are reasonable outputs consistent with anticipated markets and minimum sized equipment. The markets in which the products would compete are expected to be 8 m.m. fbm. of poplar semi-dimension stock in the Lake States and 235 m.m. sq.ft. of industrial purpose graduated particleboard in the Lake States and the four central Canadian provinces by 1970.

The potential output of the particleboard plant is in excess of 41 million square feet 3/4 inch basis, operating seven days per week instead of five and the sawmill-dimension plant could produce 3 million fbm. of semi-finished dimension stock plus 2 million fbm. of air-dry lumber, operating 24 hours per day, 5 days per week.

The particleboard mill utilized Pallman flakers, Bahre-Bison blenders, a Bahre-Bison former, a Cauless conveyor system through the forming and pressing line and

Washington Iron Works presses in addition to the complex of chip handling and board finishing equipment.

For the production of waferboard, two Ortmann flakers, phenol resin preparation equipment and extra conveyors and blowers were added to the basic particleboard plant.

Veneer handling, pressing and finishing facilities were also included as additions to the basic particleboard plant.

The capital costs provided for a 55 acre site, all steel buildings sprinklered throughout, a fire main system, fire pumps and an emergency reservoir of 600,000 gallon capacity.

For both locations natural gas was used in the calculations. In the case of Slave Lake, the town is developing its own gas supplies. Northland Utilities Ltd. has the gas franchise for Smith and provided an estimate on the price of gas supplied to that location.

The prices of gas, power, insurance used in the report are open for further negotiation. Municipal taxes were based on existing mill rates and may be

Subject to change should a major industry enter the area. The cost of long and short term capital was estimated at 8%.

(b) Conclusions

A detailed financial analysis of the operations is given on pages 15 - 32 of the report and indicate requirements, net profits, cash flows, pay-off periods, return on investments, interest rate of return, break-even production levels, and minimum days of production to reach break-even production levels for each combination of products produced.

The profitability of the integrated plant for various combinations of products was found to be as follows:-

	Return on Total Investment %	Return on Equity (50%) %	Interest Rate of Return %
Graduated Particleboard	6.4	12.8	8.1
Graduated Particleboard & Semi-dimension stock	7.5	15.0	10.5
Graduated Particleboard & Semi-dimension stock & Veneered Board	8.0	16.0	11.2
Graduated Particleboard & Semi-dimension stock & Wafer Board	5.1	10.2	5.5
Graduated Particleboard and Veneered Board	6.4	12.8	8.5
Semi-dimension stock (on an integrated basis)	7.0	14.0	11.5

The figures on Page 12 indicate that the integrated plant producing graduated particleboard, semi-dimension stock, and veneered board will offer the greatest return on investment and the best investment opportunity. Particleboard and semi-dimension stock contribute significantly towards profit, whereas veneered board contributes little to profit and waferboard detracts from profit.

It was concluded from the findings of the investigation and study that an opportunity exists at Slave Lake or Smith, Alberta, for the profitable establishment of an integrated plant producing poplar wood products.

Should the plant be located at Smith, the costs and profits will likely be affected as follows:

(Fixed Assets $7,387,885)

	Slave Lake	Smith	Change in Gross Profit
Taxes	55 mills	74 mills	0.3456 x $80,675 = minus $27,900
Power	same	same	
Labour	same	same	
Wood	same	same	
Cost of Natural Gas	16¢/mcf.	40¢/mcf	1.5 x $52,700 = minus $79,000
Designated Area Grant	nil	$1,548,177	@ 8% adds $123,800 to gross profit

NET DIFFERENCE $16,900 gross profit per year in favor of Smith.

Plus accelerated depreciation.

On the overall operation, it was assumed that net revenues realized at a Smith location would closely approach those generated at a Slave Lake location. That is, there would be no significant difference in total freight costs.

FINANCIAL ANALYSIS

ANNUAL PRODUCTION	SHIFTS	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE*
Graduated Particleboard	3	22.5	250	32,700 m.sq.ft.	$4,337,507
Waferboard					
Veneered Board					
Dry Kiln Lumber					
Semi-dimension parts					
Annual Net Revenue					$4,337,507

FINANCIAL ANALYSIS OF THE PARTICLEBOARD PLANT SEPARATELY - WITHOUT INTEGRATION WITH OTHER OPERATIONS.

Initial Fixed Capital	$6,352,500
Initial Working Capital (annual average)	607,230
Initial Capital Requirement	6,959,730
* Total Net Revenue from Sales	4,337,507
Total Cost of Manufacturing	3,148,400
Gross Profit before Finance Charges	1,189,107
Financial Charges @ 8 %	302,500
Profit before Income Taxes	886,607
Income Taxes	442,020
Net Profit	444,587

* Total revenue less freight less tariff less commission where applicable.

Particleboard - Unintegrated

Net Profit $444,587

Annual Depreciation 508,477

Annual Cash Flow 953,064

Capital Pay-off:

$$\frac{\text{Capital Cost Plant \& Equipment}}{\text{Annual Cash Flow}} = \frac{6352500}{953064} = \underline{6.7 \text{ yrs}}$$

Equity Pay-off (equity at 50% capital)

$$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{3176250}{953064} = \underline{3.3 \text{ yrs}}$$

CAUTION
TENTATIVE ONLY
SUBJECT TO CHANGE WITHOUT NOTICE

Profit as a % of total investment =

$$\frac{\text{net profit}}{\text{Initial Capital Requirements}} = \underline{6.4\%}$$

Return on Equity =

$$\frac{\text{net profit}}{\text{equity}} = \underline{12.8\%}$$

Interest Rate of return on total fixed assets = 8.1%

Particleboard - Unintegrated

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft. - direct costs per sq.ft.}}$$

Particleboard $\frac{983077}{0.13265 - 0.06833}$ = 15,300,000 sq.ft.

Days of Production to break-even =

$$\frac{\text{Break-even point}}{\text{Annual production}} \times \text{annual production days} = \underline{\text{117 days}}$$

$$\frac{15{,}300{,}000}{32{,}700{,}000} \times 250$$

FINANCIAL ANALYSIS

ANNUAL PRODUCTION	SHIFTS	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE*
* Graduated Particleboard	3	22.5	250	32,700 m.sq.ft.	$4,337,507
Wafer Board					
Veneered Board					
Dry Kiln Lumber					
* Semi-dimension parts	2	16	230	2 m.m.fbm.	659,860
Annual Net Revenue					4,997,367

Initial Fixed Capital	$6,990,160
Initial Working Capital (annual average)	781,795
Initial Capital Requirement	7,771,955
*Total Net Revenue from Sales	4,997,367
Total Cost of Manufacturing	3,493,055
Gross Profit before Finance Charges	1,504,312
Financial Charges @ 8 %	332,727
Profit before Income Taxes	1,171,585
Income Taxes	587,358
Net Profit	584,227

* Total revenue less freight less tariff less commission where applicable.

Net Profit $584,227

Annual Depreciation 568,036

Annual Cash Flow 1,152,313

Capital Pay-off

$$\frac{\text{Capital Cost Plant \& Equipment}}{\text{Annual Cash Flow}} = \frac{6,990,160}{1,152,313} = \underline{6.07\text{ yrs}}.$$

Equity Pay-off (equity at 50% capital)

$$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{3,495,080}{1,152,313} = \underline{3.03\text{ yrs}}.$$

Profit as a % of total investment =

$$\frac{\text{net profit}}{\text{Initial Capital Requirements}} = \underline{7.5\%}$$

Return on Equity =

$$\frac{\text{net profit}}{\text{equity}} = \underline{15.0\%}$$

Interest Rate of return on total fixed assets = 10.5%

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft. - direct costs per sq.ft.}}$$

Particleboard $$\frac{940{,}883}{.13265 - .06461}$$

$$= \frac{940{,}883}{.06804} = 13{,}828{,}000 \text{ sq.ft.}$$

Semi-dimension $$\frac{119700}{0.32993 - 0.21597} = 1{,}050{,}369 \text{ fbm}$$

Days of Production to break-even =

$$\frac{\text{Break-even point}}{\text{Annual production}} \times \text{annual production days} = \underline{\hspace{3cm}}\text{days}$$

Particleboard $$\frac{13{,}828{,}000}{32{,}700{,}000} \times 250 = 106 \text{ days of production}$$

Semi-dimension $$\frac{1{,}050{,}369}{2{,}000{,}000} \times 230 = 121 \text{ days of production}$$

FINANCIAL ANALYSIS

	ANNUAL PRODUCTION	SHIFT	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE
*	Graduated Particleboard	3	22.5	200	26,200 m.sq.ft.	$3,740,402
	Wafer Board					
*	Veneered Board	1	8	250	6,500 m.sq.ft.	1,564,938
	Dry Kiln Lumber					
*	Semi-dimension parts	2	16	230	2 m.m. fbm.	659,860
	Annual Net Revenue					$5,965,200

Initial Fixed Capital	$7,387,885
Initial Working Capital (annual average)	855,645
Initial Capital Requirement	8,243,530

*Total Net Revenue from Sales	5,965,200
Total Cost of Manufacturing	4,252,647
Gross Profit before Finance Charges	1,702,553
Financial Charges @ 8 %	370,452
Profit before Income Taxes	1,332,101
Income Taxes	669,222
Net Profit	662,879

* Total revenue less freight less tariff less commission where applicable.

Net Profit $662,879

Annual Depreciation 602,858

Annual Cash Flow 1,265,737

Capital Pay-off:

Capital Pay-off:

$$\frac{\text{Capital Cost Plant \& Equipment}}{\text{Annual Cash Flow}} = \frac{7,387,885}{1,265,737} = \underline{5.84 \text{ yrs.}}$$

Equity Pay-off (equity at 50% capital)

$$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{3693942}{1265737} = \underline{2.92 \text{ yrs.}}$$

Profit as a % of total investment =

$$\frac{\text{net profit}}{\text{Initial Capital Requirements}} = \underline{8\%}$$

Return on Equity =

$$\frac{\text{net profit}}{\text{equity}} = \underline{16\%}$$

Interest Rate of return on total fixed assets = 11.25%

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft. - direct costs per sq.ft.}}$$

Particleboard $$\frac{752{,}706}{.14276 - .06461} = 9{,}600{,}000 \text{ sq.ft.}$$

Veneered Board $$\frac{271{,}181}{.24076 - .19329} = 5{,}715{,}000 \text{ sq.ft.}$$

Semi-dimension stock $$\frac{119{,}700}{0.32993 - 0.21597} = 1{,}050{,}369 \text{ fbm}$$

Days of Production to break-even =

$$\frac{\text{Break-even point}}{\text{Annual production}} \text{ x annual production days} = \underline{\hspace{3cm}} \text{days}$$

Particleboard $$\frac{9{,}600{,}000 \text{ x } 200}{26{,}200{,}000} = 74 \text{ days}$$

Veneered Board $$\frac{5{,}715{,}000 \text{ x } 250}{\$6{,}500{,}000} = 220 \text{ days}$$

Semi-dimension stock $$\frac{1{,}050{,}369 \text{ x } 230}{2{,}000{,}000} = 121 \text{ days}$$

FINANCIAL ANALYSIS

ANNUAL PRODUCTION	SHIFTS	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE
* Graduated Particleboard	3	22.5	212	27,730 m.sq.ft.	$3,678,038
* Wafer Board	3	22.5	38	4,970 m.sq.ft.	343,868
Veneered Board					
Dry Kiln Lumber					
* Semi-dimension parts	2	16	230	2 m.m. fbm.	659,860
Annual Net Revenue					4,681,766

Initial Fixed Capital	$7,485,535
Initial Working Capital (annual average)	781,800
Initial Capital Requirement	8,267,335

* Total Net Revenuefrom Sales	4,681,766
Total Cost of Manufacturing	3,500,054
Gross Profit before Finance Charges	1,181,712
Financial Charges @ 8 %	335,755
Profit before Income Taxes	845,957
Income Taxes	421,288
Net Profit	424,669

* Total revenue less freight less tariff less commission where applicable.

Net Profit $424,669

Annual Depreciation $576,903

Annual Cash Flow $1,001,572

Capital Pay-off:

$$\frac{\text{Capital Cost Plant \& Equipment}}{\text{Annual Cash Flow}} = \frac{7{,}485{,}535}{1{,}001{,}572} = \underline{7.5}\text{ yrs.}$$

Equity Pay-off (equity at 50% capital)

$$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{3{,}742{,}767}{1{,}001{,}572} = \underline{3.7}\text{ yrs.}$$

Profit as a % of total investment =

$$\frac{\text{net profit}}{\text{Initial Capital Requirements}} = \underline{5.12}\ \%$$

Return on Equity =

$$\frac{\text{net profit}}{\text{equity}} = \underline{10.24\%}$$

Interest Rate of return on total fixed assets = 5.5%

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft.} - \text{direct costs per sq.ft.}}$$

Particleboard $\frac{797{,}868}{.13264 - 0.06461}$ = 11,750,000 sq.ft.

Waferboard $\frac{155{,}714}{.06919 - .06397}$ Unattainable

Semi-dimension stock $\frac{119{,}700}{0.32993 - 0.21597}$ = 1,050,369 fbm

Days of Production to break-even =

$\frac{\text{Break-even point}}{\text{Annual production}}$ x annual production days = __________ days

Particleboard $\frac{11{,}750{,}000}{27{,}730{,}000}$ x 230 = 98 days

Semi-dimension stock $\frac{1{,}050{,}369}{2{,}000{,}000}$ x 230 = 121 days

Waferboard - unattainable

FINANCIAL ANALYSIS

ANNUAL PRODUCTION	SHIFTS	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE*
Graduated Particleboard	3	22.5	200	26,200 m.sq.ft.	$3,740,402
Wafer Board					
Veneered Board	1	8	250	6,500 m.sq.ft.	1,564,938
Dry Kiln Lumber					
Semi-dimension parts					
Annual Net Revenue					5,305,340

Initial Fixed Capital $6,750,225

Initial Working Capital (annual average) 681,080

Initial Capital Requirement $7,431,305

* Total Net Revenue from Sales $5,305,340

Total Cost of Manufacturing 4,027,558

Gross Profit before Finance Charges 1,277,782

Financial Charges @ 8 % 324,318

Profit before Income Taxes 953,464

Income Taxes 476,117

Net Profit 477,347

* Total revenue less freight less tariff less commission where applicable.

Net Profit $477,347

Annual Depreciation 543,250

Annual Cash Flow 1,020,597

Capital Pay-off:

$$\frac{\text{Capital Cost Plant \& Equipment}}{} = \frac{6,750,225}{1,020,597} = \underline{6.6 \text{ yrs}}.$$

Equity Pay-off (equity at 50% capital)

$$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{3,375,113}{1,020,597} = \underline{3.3 \text{ yrs}}.$$

Profit as a % of total investment =

$$\frac{\text{net profit}}{\text{Initial Capital Requirements}} = \underline{6.4\%}$$

Return on Equity =

$$\frac{\text{net profit}}{\text{equity}} = \underline{12.8\%}$$

Interest Rate of return on total fixed assets = 8.5%

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft. - direct costs per sq.ft.}}$$

Particleboard $$\frac{786{,}462}{.14276 - .06834} = \frac{786{,}462}{.07442} = 10{,}568{,}000\text{sq.ft.}$$

Veneered Board $$\frac{263{,}713}{.24076 - .19704} = \frac{263{,}713}{.04372} = 6{,}032{,}000\text{sq.ft.}$$

Days of Production to break-even =

$$\frac{\text{Break-even point}}{\text{Annual production}} \text{ x annual production days} = \qquad \text{days}$$

Particleboard $$\frac{10{,}568{,}000 \text{ x } 200}{26{,}200{,}000} = 80 \text{ days}$$

Veneered Board $$\frac{6{,}032{,}000 \text{ x } 250}{6{,}500{,}000} = 232 \text{ days}$$

FINANCIAL ANALYSIS

ANNUAL PRODUCTION	SHIFTS	PROD. HOURS	DAYS	ANNUAL PRODUCTION	NET REVENUE
Graduated Particleboard					
Wafer Board					
Veneered Board					
Dry Kiln Lumber					
(sawmill) Semi-dimension parts	1shift 2shifts	8 16	230	2,000,000 fbm of semi-dim.	$659,860
Annual Net Revenue					

FINANCIAL ANALYSIS OF THE SAWMILL - SEMI-DIMENSION STOCK MANUFACTURING INTEGRATED WITH THE PARTICLE BOARD PLANT.

Initial Fixed Capital	$712,610
Initial Working Capital (annual average)	188,000
Initial Capital Requirement	900,610

Total Net Revenue from Sales	$659,860
Total Cost of Manufacturing	517,410
Gross Profit before Finance Charges	142,450
Financial Charges @ 8 %	34,227
Profit before Income Taxes	$108,223
Income Taxes	45,044
Net Profit	$ 63,179

* Total revenue less freight less tariff less commission where applicable.

(As integrated with the particleboard plant)

Net Profit ________ $63,179

Annual Depreciation ________ 61,461

Annual Cash Flow ________ 124,640

Capital Pay-off:

Capital Cost Plant & Equipment $= \frac{712610}{124640} =$ 5.7 yrs.

Equity Pay-off (equity at 50% capital)

$\frac{\text{Equity}}{\text{Annual cash flow}} = \frac{356305}{124640} =$ 2.8 yrs.

Profit as a % of total investment =

$\frac{\text{net profit}}{\text{Initial Capital Requirements}} =$ 7%

Return on Equity =

$\frac{\text{net profit}}{\text{equity}} =$ 14%

Interest Rate of return on total fixed assets = 11.5%

Break-even points =

$$\frac{\text{Total annual fixed costs}}{\text{Net revenue per sq.ft. - direct costs per sq.ft.}}$$

(as integrated with the particle board plant)

Semi-dimension stock $\frac{119700}{0.32993 - 0.21597}$ = 1,050,369 fbm

Days of Production to break-even =

$\frac{\text{Break-even point}}{\text{Annual Production}}$ x annual production days = ________days

Semi-dimension stock $\frac{1,050,369}{2,000,000}$ x 230 = 121 days of prod.

SELECTED PRODUCTS & MARKETS

A field survey of wood products firms was conducted throughout the Prairie Provinces, the U.S. Lake States and California, supplemented by extensive correspondence with government and industry officials throughout North America. The prospects and characteristics of the markets for lumber, plywood, pulp, paper, hardboard, softboard, particleboard and industrial components were examined to determine the products that could be manufactured from Alberta poplar.

Two of the more promising market opportunities were found to be for particleboard and poplar semi-finished industrial components. A discussion of these markets was given in the Poplar Wood Products, Market Survey and Supplementary Survey Reports. Both products are mainly dependent upon export markets and face significant tariffs, which are now being reduced over a five year period to an effective level, allowing for the exchange rate of 2%.

It is estimated that particleboard consumption in Canada is presently at a rate of 125 m.m. sq.ft. per year. This demand is met by 120 m.m. sq.ft. 3/4" basis of domestic production and 5 m.m. sq.ft. of imported board. Particleboard production in

the U.S. is estimated to total 1-billion sq.ft. 3/4" basis. Production of particleboard in North America has been increasing at the rate of 20% per year and is expected to continue to do so through 1972 when the U.S. market is expected to be 3.5 billion to 5 billion sq.ft., 3/4" basis and the Canadian market is expected to be 200 m.m. sq.ft. Prevailing prices for high quality graduated board suitable for corestock is $190 per m.sq.ft. 3/4" basis on the prairies, $170 is eastern Canada and $190 in Chicago for cut-to-size panels. Upgrading the graduated board with veneer overlays increases the price to $300 per m.sq.ft. An alternative board suitable for sheathing, is priced at $110 per m.sq.ft. All merchandising margins must be added to these prices but delivery costs and duty must be deducted from them.

The market segment to which the proposed output is directed is the manufacturing industry rather than the construction industry. Because the areas are far removed from the point of production, the output must be of high quality to justify high freight costs, and to place it favorably in the market in relation to competing and substitute products. Principal users of the graduated particleboard, with and without wood veneer overlays, are cabinet and millwork firms. The flakeboard for sheathing use obviously depends upon the construction industry for its

market. By catering to the manufacturing industry, the graduated particleboard would be separated from the highly competitive underlayment market and its extreme price fluctuations.

The scale of output proposed for the Alberta particleboard plant is somewhat smaller than that of U.S. competitors but marketing difficulties prevent a larger operation. Output of 170 tons per day or 32,700,000 sq.ft. per year represents approximately 25% of Canadian output and since much of the current production is underlayment and sheathing material, it would be necessary to capture up to 60% of the particular market in which the core material would compete. The Lake States Industrial Board Market, centered in Chicago, absorbs in the order of 175 m.m. sq.ft. annually or roughly five times the proposed output. While it may be more convenient to serve domestic markets only, a substantial portion of the output must be exported to this U.S. market.

It was determined in the market studies that the most receptive market for poplar industrial components was also centered in Chicago. Although the demand for wood components is large, only limited opportunity exists for poplar. The

total requirement for wood components in the North Central States is in the order of 450 m.m. fbm. per year but the principal distributors sell only 5-6 m.m. fbm. of poplar stock per year. It is believed that an additional 2 m.m. fbm. of poplar stock could be marketed primarily to kitchen and appliance cabinet manufacturers. While finished dimension stock is more valuable on a unit basis, it would be more practical to supply semi-finished stock during the initial stages. This semi-finished stock, in basic shapes and sizes, would sell at approximately $430 per m.fbm., including freight, commissions and duty.

REVENUES

Semi-finished Dimension Stock

At the initial level of output of 2 m.m. fbm. per year and a price of $428 per m.fbm., gross annual revenue from sale of semi-finished dimension stock would be $856,000. Since all of this output would be sold in the U.S., it would be subject to a tariff of 17.5% in 1970 this tariff will be reduced to 12.1%. Additional distributing costs include a 5% brokers' commission and a freight rate of $1.42 per cwt., including a 5% railway surcharge. To avoid paying tariff on freight and commissions, it is suggested that sales be arranged on an F.O.B. mill basis. This involves deducting freight costs of $31.25 per m.fbm. and commissions of $21.40 per m.fbm. The 12.1% duty is then applied to the remaining $375.35. Deducting duty of $45.42 leaves a net revenue to the mill of $329.93 per m.fbm. For 2 m.m. fbm., net annual revenue is $659,860.

Particleboard Products

Net revenue calculations for graduated particleboard, homogeneous waferboard and wood veneered graduated board are set out as follows:

NET REVENUE AND SELLING COSTS PER M. SQ.FT.

Graduated Board

Market	Price[1]	Less Freight[2]	Less Tariff[3]	Net Revenue
Calgary	$190	$19.80	-	$170.20
Edmonton	190	10.17	-	179.83
Winnipeg	190	33.00	-	157.00
Toronto	170	61.05	-	108.95
Minneapolis	190)*	34.38	18.83	136.79
Chicago	190)	39.05	18.26	132.69

* Cut-to-size

Veneer Board

Market	Price	Less Freight[2]	Less Tariff[3]	Net Revenue
Calgary	$300	$19.80	-	$280.20
Edmonton	300	10.17	-	289.83
Winnipeg	300	33.00	-	267.00
Toronto	300	61.05	-	238.95
Minneapolis	300	34.38	32.14	233.48
Chicago	300	39.05	31.57	229.38

Flakeboard

Market	Price	Less Freight[2]	Less Tariff[3]	Net Revenue
Calgary	$110	$19.80	-	$90.20
Edmonton	110	10.17	-	99.83
Saskatoon	110	24.20	-	85.80
Regina	110	28.05	-	81.95
Winnipeg	110	33.00	-	77.00
Toronto	110	61.05	-	48.95

[1] All amounts are presented in Canadian dollars.

[2] Freight rates are based on truck common carrier quotes for Canadian shipments and rail freight for U.S. shipments. The applicable rates are:

Slave	Lake	to	Edmonton	37¢	per cwt.
"	"	"	Calgary	72¢	per cwt.
"	"	"	Saskatoon	88¢	per cwt.
"	"	"	Regina	1.02	per cwt.
"	"	"	Winnipeg	1.20	per cwt.
"	"	"	Toronto	2.22	per cwt.
"	"	"	Minneapolis	1.25	per cwt.
"	"	"	Chicago	1.42	per cwt.

[3] Tariff is calculated on the basis of 12.1%, the expected 1970 level.

Expected sales distributions and resulting net revenues follow.

A. Graduated particleboard.

800 m. sq.ft. in Calgary	@ $170.20/m. sq.ft.	$ 136,160
900 m. sq.ft. in Edmonton	@ $179.83/m. sq.ft.	161,847
1 m.m. sq.ft. in Winnipeg	@ $157.00/m. sq.ft.	157,000
5 m.m. sq.ft. in Toronto	@ $108.95/m. sq.ft.	544,750
5 m.m. sq.ft. cut-to-size in Minneapolis	@ $136.79/m. sq.ft.	683,950
20m.m. sq.ft. cut-to-size in Chicago	@ $132.69/m. sq.ft.	2,653,800
Annual net revenue		$4,337,507

3 shifts, 250 days, 32,700,000 sq.ft./yr.

Average Revenue: $17,350.03 per day

$132.65 per m. sq.ft.

B. Graduated Particleboard Plus Veneer Board.

800 m. sq.ft.	graduated board	in Calgary	@ $170.20	$ 136,160
250 m. sq.ft.	veneer board	in Calgary	@ $280.20/m. sq.ft.	70,050
900 m. sq.ft.	graduated board	in Edmonton	@ $179.83	161,847
250 m. sq.ft.	veneer board	in Edmonton	@ $289.83/m. sq.ft.	72,458
1 m.m. sq.ft.	graduated board	in Winnipeg	@ $157.00	157,000
500 m. sq.ft.	veneer board	in Winnipeg	@ $267.00/m. sq.ft.	133,500
2 m.m. sq.ft.	veneer board	in Toronto	@ $238.95	477,900
5 m.m. sq.ft.	graduated board	in Toronto	@ $108.95	544,750
5 m.m. sq.ft.	graduated board	in Minneapolis	@ $136.79	683,950
2 m.m. sq.ft.	veneer board	in Minneapolis	@ $233.48/m. sq.ft.	466,960
15.5 m.m. sq.ft.	graduated board	in Chicago	@ $132.69	2,056,695
1.5 m.m. sq.ft.	veneer board	in Chicago	@ $229.38/m. sq.ft.	344,070
	Annual net Revenue			$5,305,340

3 shifts, 250 days, 32,700,000 sq.ft./yr. of which 6,500,000 sq.ft. is veneered on 1 shift, 250 days.

Graduated board revenue = $3,740,402 for 26,200,000 sq.ft. = $142.76/m. sq.ft.
Veneer board revenue = $1,564,938 for 6,500,000 sq.ft. = $240.76/m. sq.ft.

Average net revenue per day: $21,221.36.

C. Graduated Board Plus Flakeboard.

800 m. sq.ft.	graduated board	in Calgary	@ $170.20	$ 136,160
750 m. sq.ft.	flakeboard	in Calgary	@ $ 90.20	67,650
900 m. sq.ft.	graduated board	in Edmonton	@ $179.83	161,847
750 m. sq.ft.	flakeboard	in Edmonton	@ $ 99.83	74,873
250 m. sq.ft.	flakeboard	in Saskatoon	@ $ 85.80	21,450
250 m. sq.ft.	flakeboard	in Regina	@ $ 81.95	20,488
1 m.m. sq.ft.	graduated board	in Winnipeg	@ $157.00	157,000
500 m. sq.ft.	flakeboard	in Winnipeg	@ $ 77.00	38,500
5 m.m. sq.ft.	graduated board	in Toronto	@ $108.95	544,750
2.47 m.m. sq.ft.	flakeboard	in Toronto	@ $ 48.95/m. sq.ft.	120,907
5 m.m. sq.ft.	graduated board	in Minneapolis	@ $136.79	683,950
15.03 m.m. sq.ft.	graduated board	in Chicago	@ $132.69	1,994,331
	Annual net Revenue			$4,021,906

Graduated board - 3 shifts, 212 days, 27,730,000 sq.ft.
Flakeboard - 3 shifts, 38 days, 4,970,000 sq.ft.

Graduated Board Revenue $3,678,038 or $132.64/m. sq.ft.
Flakeboard Revenue $343,868 or $ 69.19/m. sq.ft.

Average net revenue per day: $16,087.62.

D. Graduated Board Plus Veneer Board Plus Flakeboard.

800 m. sq.ft.	graduated board	in Calgary	@ $170.20	$136,160
250 m. sq.ft.	veneer board	in Calgary	@ $280.20	70,050
750 m. sq.ft.	flakeboard	in Calgary	@ $ 90.20	67,650
900 m. sq.ft.	graduated board	in Edmonton	@ $179.83	161,847
250 m. sq.ft.	veneer board	in Edmonton	@ $289.83	72,458
750 m. sq.ft.	flakeboard	in Edmonton	@ $ 99.83	74,873
250 m. sq.ft.	flakeboard	in Saskatoon	@ $ 85.80	21,450
250 m. sq.ft.	flakeboard	in Regina	@ $ 81.95	20,488
1 m.m. sq.ft.	graduated board	in Winnipeg	@ $157.00	157,000
500 m. sq.ft.	veneer board	in Winnipeg	@ $267.00	133,500
500 m. sq.ft.	flakeboard	in Winnipeg	@ $ 77.00	38,500
5 m.m. sq.ft.	graduated board	in Toronto	@ $108.95	544,750
2 m.m. sq.ft.	veneer board	in Toronto	@ $238.95	477,900
2.47 m.m. sq.ft.	flakeboard	in Toronto	@ $ 48.95	120,907
5 m.m. sq.ft.	graduated board	in Minneapolis	@ $136.79	683,950
2 m.m. sq.ft.	veneer board	in Minneapolis	@ $233.48	466,960
8.53 m.m. sq.ft.	graduated board	in Chicago	@ $132.69	1,131,846
1.5 m.m. sq.ft.	veneer board	in Chicago	@ $229.38	344,070
	Annual net Revenue			$4,724,359

Graduated board - 3 shifts, 212 days, 27,730,000 sq. ft. of which 6,500,000 sq. ft. is veneered on 1 shift, 250 days.

Flakeboard - 3 shifts, 38 days, 4,970,000 sq. ft. of which 21,230,000 sq. ft. graduated board marketed for $2,815,553 or $132.62/m. sq. ft.

6,500,000 sq. ft. veneer board marketed for $1,564,938 or 240.76/m. sq. ft.

4,970,000 sq. ft. flakeboard marketed for $343,868 or 69.19/M. sq. ft.

Average Revenue per day: $18,897.44

GENERAL CONCEPT

The proposed plant allows primarily for the production of graduated particleboard and kiln dried semi-dimension furniture parts. The equipment required for the production of waferboard and for the veneering of particleboard are considered as additions to the basic plant and equipment. The overall layout of the plant allows for the close integration of the sawmill and lumber finishing operations with the production of particleboard. The sawmill and the particleboard plant utilize common log storage handling and debarking facilities. In addition to peeled round wood the supply of wood to the particleboard plant includes waste slabs and ends from the sawmill and waste ends, trimmings and shavings from the semi-dimension mill.

The proposed particleboard plant has a capacity of 170 tons/day of 3/4 inch board at a density of 44 pounds per cubic foot. On a 3 shift basis and 250 operating days per year the output per year is 32,700,000 square feet of 3/4 inch board.

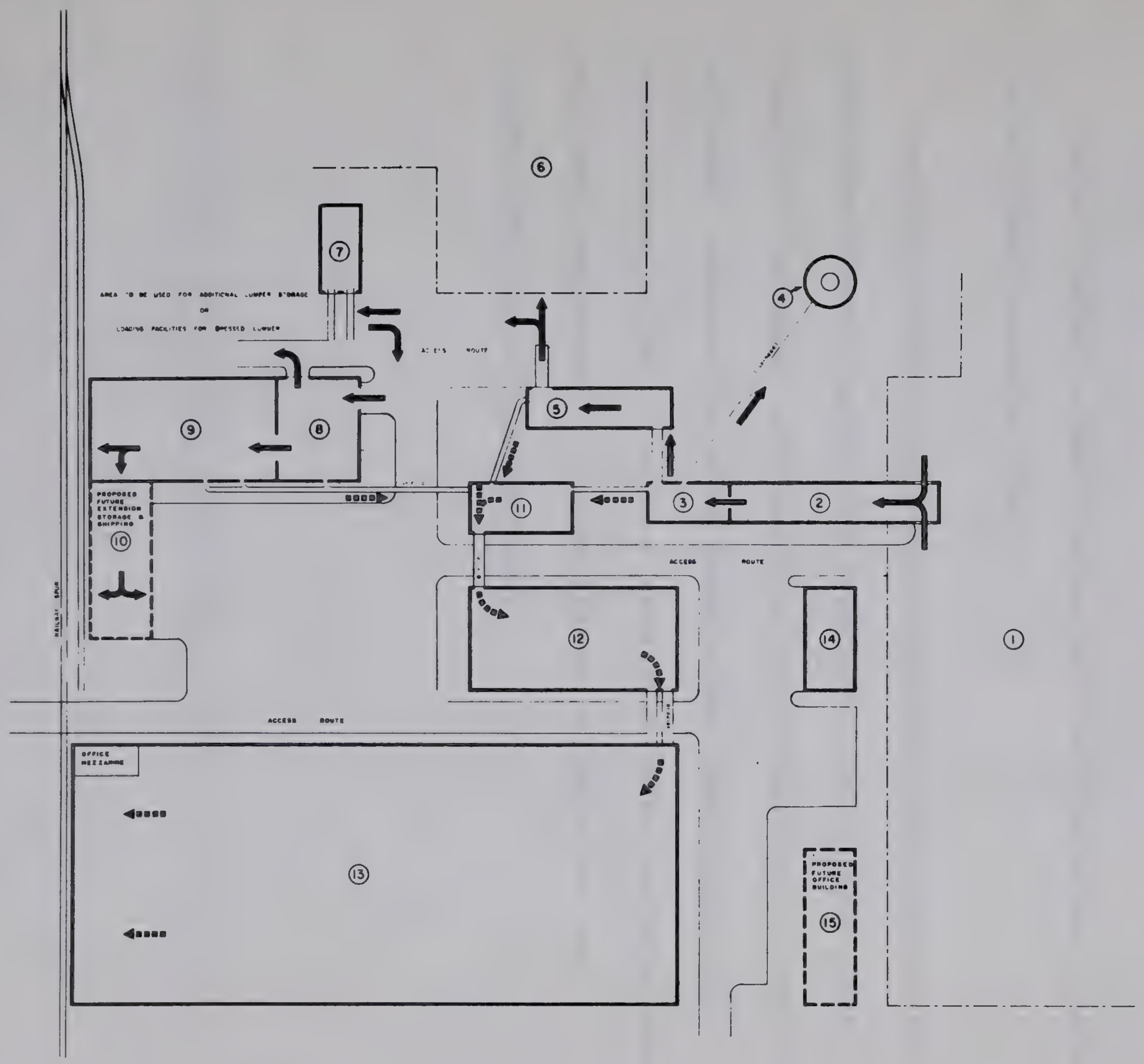
The output from the sawmill-component operation is no less than 2,000,000 fbm. of semi-dimension stock per year.

PLANT SITE

The total area required for the entire complex (including the particleboard plant, debarking plant, sawmill, dry kiln, dimension mill, lumber and log storage, rail sidings, office buildings, etc.) is approximately 55 acres of which 20 acres is required for the plant site and 35 acres for log storage and handling.

The proposed layout of the poplar wood products integrated plant is given on the following diagram and shows:

1. The wood storage facilities and yard layout for a sawmill and particleboard plant.
2. The debarking plant for both the sawmill and particleboard plant including cut-off saw and sorting mechanism.
3. The chip production, processing and particleboard plant exclusive of possible future additions for waferboard production and veneering.
4. The sawmill for the primary breakdown of wood into rough lumber.
5. The dry-kiln of sufficient capacity to handle the sawmill production.



AREA TO BE USED FOR ADDITIONAL LUMBER STORAGE
OR
LOADING FACILITIES FOR DRESSED LUMBER

① LOG STORAGE
② LOG POND
③ DEBARKER
④ BURNER
⑤ SAWMILL
⑥ ROUGH LUMBER STORAGE (OPEN AIR)
⑦ DRY KILN
⑧ PLANER
⑨ COMPONENT MANUFACTURING (PRODUCTION & STORAGE)
⑩ POTENTIAL EXPANSION OF STORAGE AREA & ADDITIONAL LOADING FACILITIES FOR RAIL OR TRUCK (FUTURE)
⑪ CHIPPING PLANT
⑫ CHIP FLAKING, CLASSIFYING & DRYING
⑬ PARTICLE BOARD PRODUCTION, FINISHING & STORAGE
⑭ MAINTENANCE
⑮ GENERAL OFFICE (FUTURE)

NOTE – buildings shown with solid lines are included in analysis of feasibility study.

GOVERNMENT OF THE PROVINCE OF ALBERTA
ALBERTA DEPARTMENT OF INDUSTRY & DEVELOPMENT

PROPOSED LAYOUT OF
POPLAR WOOD PRODUCTS COMPLEX

Industrial Forestry Service Ltd —— Prince George B.C.
Underwood McLellan & Associates Ltd —— Edmonton Alberta
DATE DRAWN – MARCH 18, 1966
DATE REVISED –
DRAWING No. – 2-B-1471

6. The dimension mill with a capacity of manufacturing no less than 2 million f.b.m. of semi-dimension poplar stock annually. The plant includes facilities for planing and resawing.
7. Proposed future warehousing and office buildings.

As indicated in the diagram, all buildings are located for efficient material flow.

Because of fire insurance regulations and prohibitive insurance rates on wood type structures (50% higher than those for the steel buildings) all buildings are of structural steel construction with sheet steel sheathing. The chip flaking building and the main production building are insulated and heated. All buildings on the site are sprinklered for fire protection.

WOOD CONSUMPTION

The following table gives an estimate of the total wood requirements for the integrated particleboard plant and sawmill-dimension plant.

Plant	Production capacity		Daily Wood Consumption		Annual wood consumption	
	per day	per year	cords	cu.ft.	cords	cu.ft.
Particle-board	170 tons (3 shifts)	42,500 tons (250 days)	170	14,450	42,500	3,612,500
Sawmill-dimension	17,400 fbm (1 shift)	4,000 M fbm (230 days)	34	2,900	7,820	664,700
TOTAL WOOD REQUIREMENT			204	17,350	50,320	4,277,200
Waste Recovery from Sawmill-Dimension Mill					6,283	
TOTAL ROUND WOOD REQUIREMENTS					44,057	cords

Conversion factors:

1 cord round wood required to produce 1 ton particleboard.

2 cords required to produce 1,000 fbm.

1 cord equivalent to 85 cubic feet

2,000 fbm lumber required to produce 1,000 fbm components (i.e., 50% recovery)

Recovery factors used for the conversion of wood from the round log form to lumber and then to semi-dimension components were based on estimates of the amount of loss that could probably be expected at each phase of manufacture.

A conversion factor of 6 fbm per cubic foot is assumed for the sawmilling operation allowing for waste from slabs, edgings, trimming and sawdust.

Kiln-drying of lumber results in a reduction in dimension and consequently a reduction in wood volume. Other losses due to warping, end and surface checking, splitting, honeycombing, collapse and case hardening occur in drying but can be minimized by proper sorting, piling, stickering and control of drying conditions.

These defects along with other defects such as knots, decay, stain, etc. can be cut out at various stages of the resawing operation. Discussion with two hardwood components manufacturers on the west coast disclosed recovery figures ranging from 30 to 55 percent in clear sound wood. Component orders that might allow a certain amount of defect such as pin-knots, slight stain or discoloration increase receovery. For the purpose of this report, a 50%

recovery was assumed for the semi-dimension stock operation, that is, production of 1,000 fbm. of stock requires processing 2,000 fbm. of lumber.

JOINT FACILITIES

The integration of the particleboard and wood component operations requires a sharing of facilities and operations common to both.

The relevant capital and operatings costs for these facilities are set out below, and the basis of allocating them to the subsequent production plants is explained.

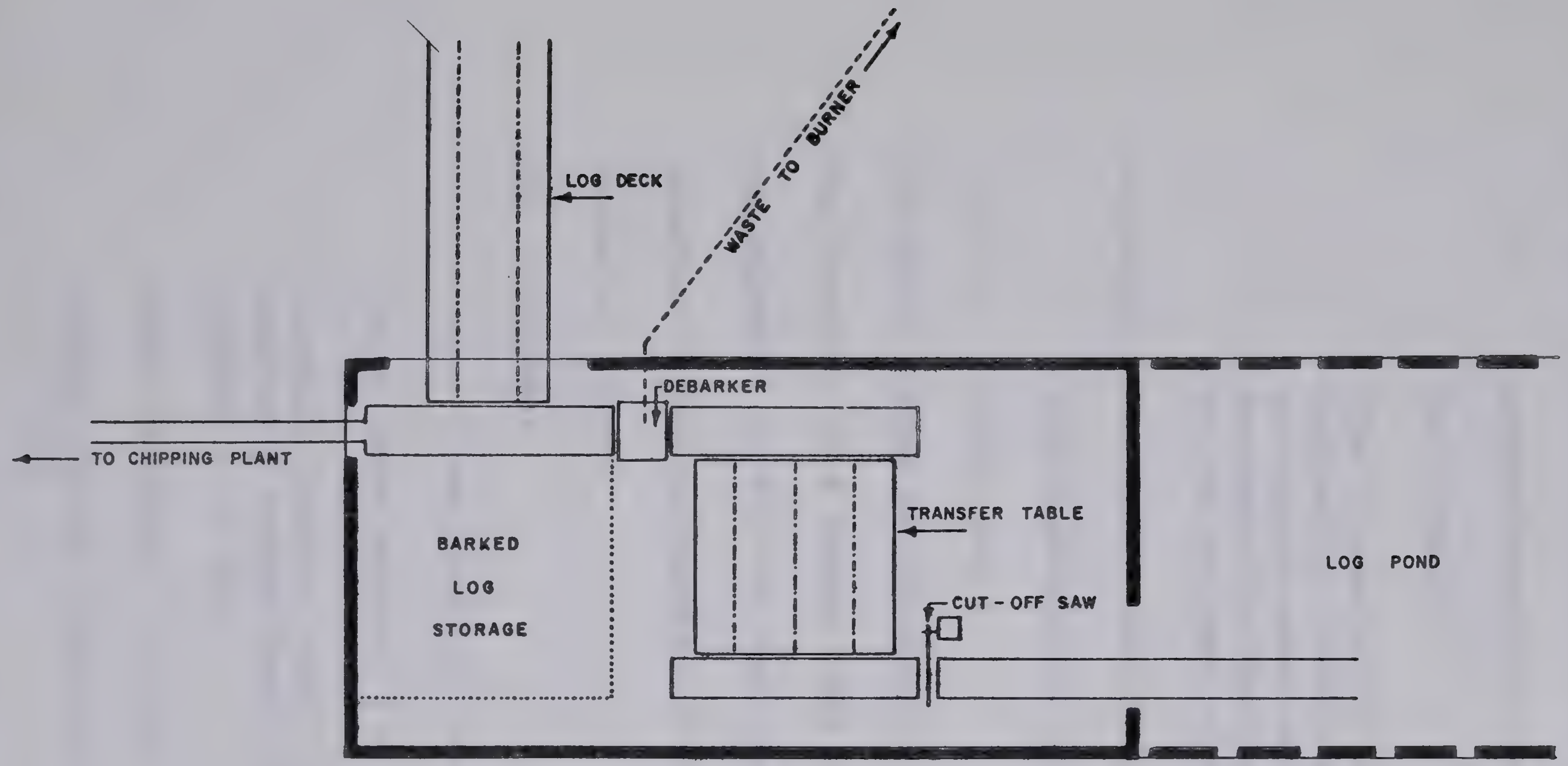
Capital Costs

(a) Log Handling

One rubber-tired, four-wheel drive front-end loader similar to a Caterpillar 966B for unloading, stacking and delivering logs. Such a machine costs $51,000.00.

(b) Debarking Plant

An equipment layout of the debarking is shown in the following diagram titled "Debarking Layout". The main equipment in the debarking plant allowed for in calculations consists of a Rosser Head type debarker.



DEBARKER LAYOUT

SCALE — 1 inch to 20 feet

The Round-wood required per shift was estimated as follows:

1st Shift - Particleboard plant plus sawmill

- approximately 91 cords or 7,735 cu.ft. (47 M fbm.)
- (The figure of 91 cords per day can be reduced by 27-28 cords per day which is the approximate amount of waste wood generated by the lumber operations and fed to the particleboard plant).

2nd Shift - Particle board plant only.

- approximately 57 cords or 4,845 cu.ft. (29 M fbm.)

3rd Shift - Same as 2nd Shift.

The capacity of a Rosser Head type debarker, such as the Morbark, is 40 - 50 fmb. per shift. One Morbark debarker should be capable of debarking the required volume of logs.

(i) Equipment

- Cut-off saw (chain), conveyors, live log decks (with drive motors) - 40 H.P.	$30,000.
- Morbark debarker with infeed, outfeed, and drive motors (max. 24 ft. log length) - 60 H.P.	$30,000.
- Waste Conveyor - 15 H.P.	$ 7,500.
- Burner (48 ft. with motor and fans (7½ H.P.)	$ 6,000.

(ii)	Installation allowance	$20,000.
(iii)	Engineering Design	$ 8,850.
(iv)	Freight allowance	$ 5,000.
(v)	Building and Foundation - Butler building - metal construction and concrete foundation. - Size 40 x 80 = 3,200 sq.ft. @ $4.90/sq.ft.	$15,680.
	- Extra concrete and steel for debarker foundation	$ 1,000.
	- Electrical Lighting	$ 3,000.
	TOTAL CAPITAL COST	$127,030.

Operating Costs

(a) Log Storage and Yard Handling

Because of inaccessible timber stands during the Summer, it was found necessary in the calculations to allow for a four month logging season.

Inventory insurance rates are $1.75 per $100 value per three years.

Insurance @ $1.75/$100 = $13,209 for 3 years.

Insurance cost per year = $4,403.

Insurance cost per cord = $0.09 based on 50,320 cords.

(b) Log Handling Cost	Cost per Year
Owning[1]	$38,081.25
Operating[2]	$30,487.50
Labour (includes 12% fringe benefits)[3]	$14,118.75
TOTAL	$82,687.50

[1] Owning Costs (Supplied by Caterpillar dealer)

Depreciation	$5.10 per hour
Interest, Insurance	$1.67 per hour
TOTAL	$6.77 per hour

[2] Operating Costs (Supplied by dealer)

Fuel and lubricants	$1.22 per hour
Repairs and labour*	$3.06 per hour
Tires	$1.14 per hour
TOTAL	$5.42 per hour

[3] *Labour - Operator $2.24 per hour

(c) Log Scaling

It was assumed that at least 2 scalers* will be required in the yard. Scaling costs were based on one shift per day for 250 days per year.

Scaling cost per year (includes 12% fringe benefits)	$10,200.00
Log scaling cost per cord	$ .20 (based on 50,320 cords)

*Scaler @ $2.28/hour.

(d) Debarking Cost

Debarking Cost	Cost per Year
Depreciation	$12,703.00
Insurance[1]	$ 635.00
Power[2]	$ 3,720.00
Labour[3]	$40,698.00
Machine Repairs & Supplies	$ 2,516.00
TOTAL	$60,272.00

Debarking and waste (bark) disposal cost per cord is $1.20 based on 50,320 cords.

[1] Insurance

Insurance rates are $1.50 per $100. value for 3 years. Insurance for the debarking plant is then $635. per year.

[2] Power

Electrical power costs are estimated to be $3,720. per year.

[3] Labour

Three men per shift at $6.46 per hour are required for three shifts per day and 250 days per year. Total estimated labour costs are $40,698. per year including 12 percent for fringe benefits.

[4] Machine repairs and supplies are estimated at $0.05 per cord or $2,516. per year.

(e) Joint Operating Costs Summary

Log Storage	$ 4,403.00	$ .09 per cord
Log Handling	$82,687.50	1.64
Log Scaling	$10,200.00	.20
Debarking	$60,272.00	1.20
TOTAL JOINT COSTS	$157,562.50	3.13 per cord

84% of cordwood throughput is consumed by the particleboard plant, therefore, this proportion of these joint costs or $132,352.56 per year is charged this operation and the remaining $25,210 is allocated to the sawmill-dimension mill operation.

PARTICLEBOARD PLANT

Description

The basic particleboard plant referred to in the report is planned to produce a graduated particleboard of finished dimensions 5 ft. x 18 ft. and of board caliper from 1/4 inch to 2 inches. The density can be varied from 30 pounds to 52 pounds per cubic foot. The calculations in the report utilize a density of 44 pounds per cubic foot. The board is produced with coarse flakes in the core for strength and with a tapering from coarse flakes to fines on the surface for smoothness.

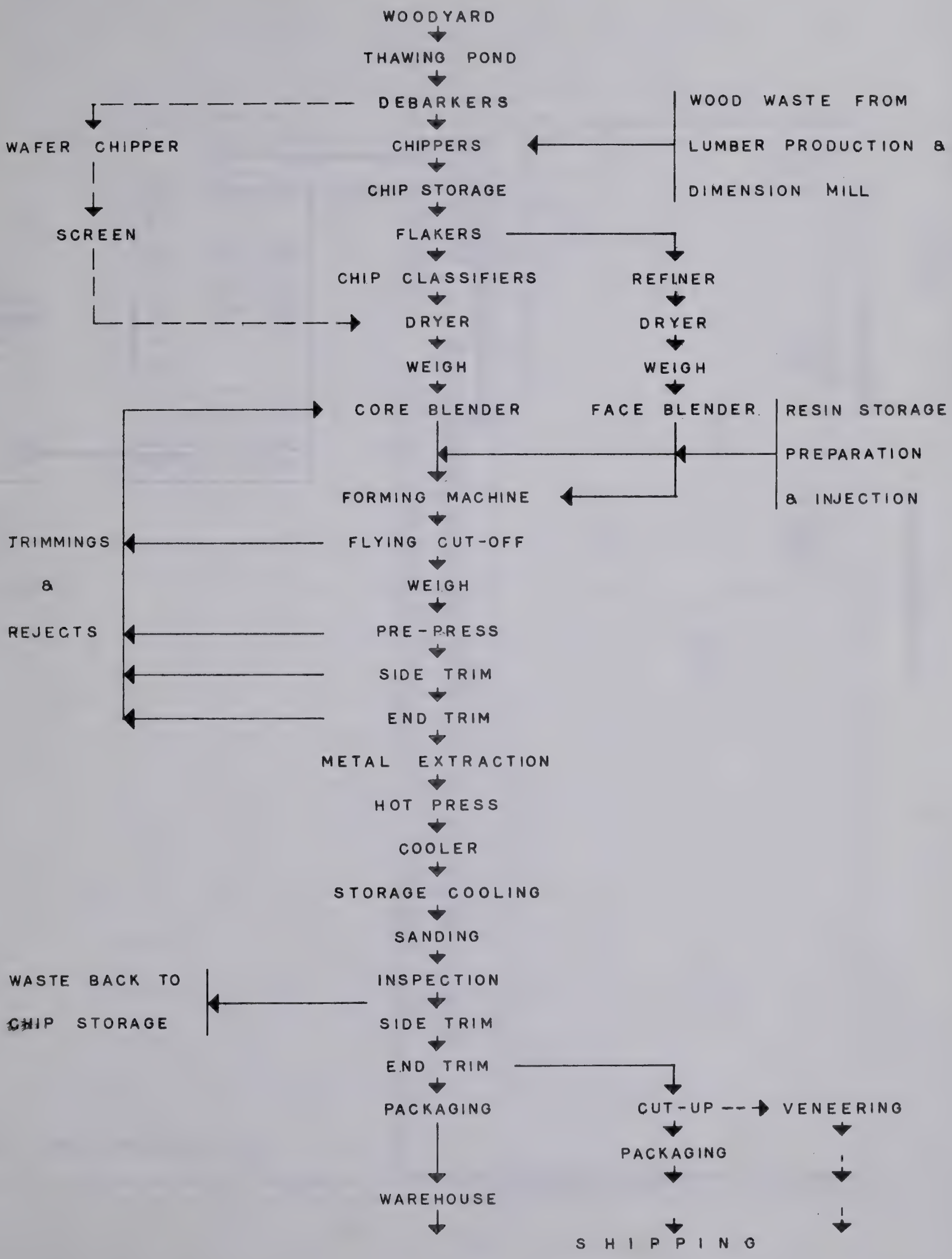
The capacity of the plant utilizing minimum acceptable sizes of appropriate equipment is rated at 170 tons per day of 3/4 inch board at a density of 44 pounds/cu. ft. on a 3 shift basis. It is intended that the plant will operate 250 days of the year.

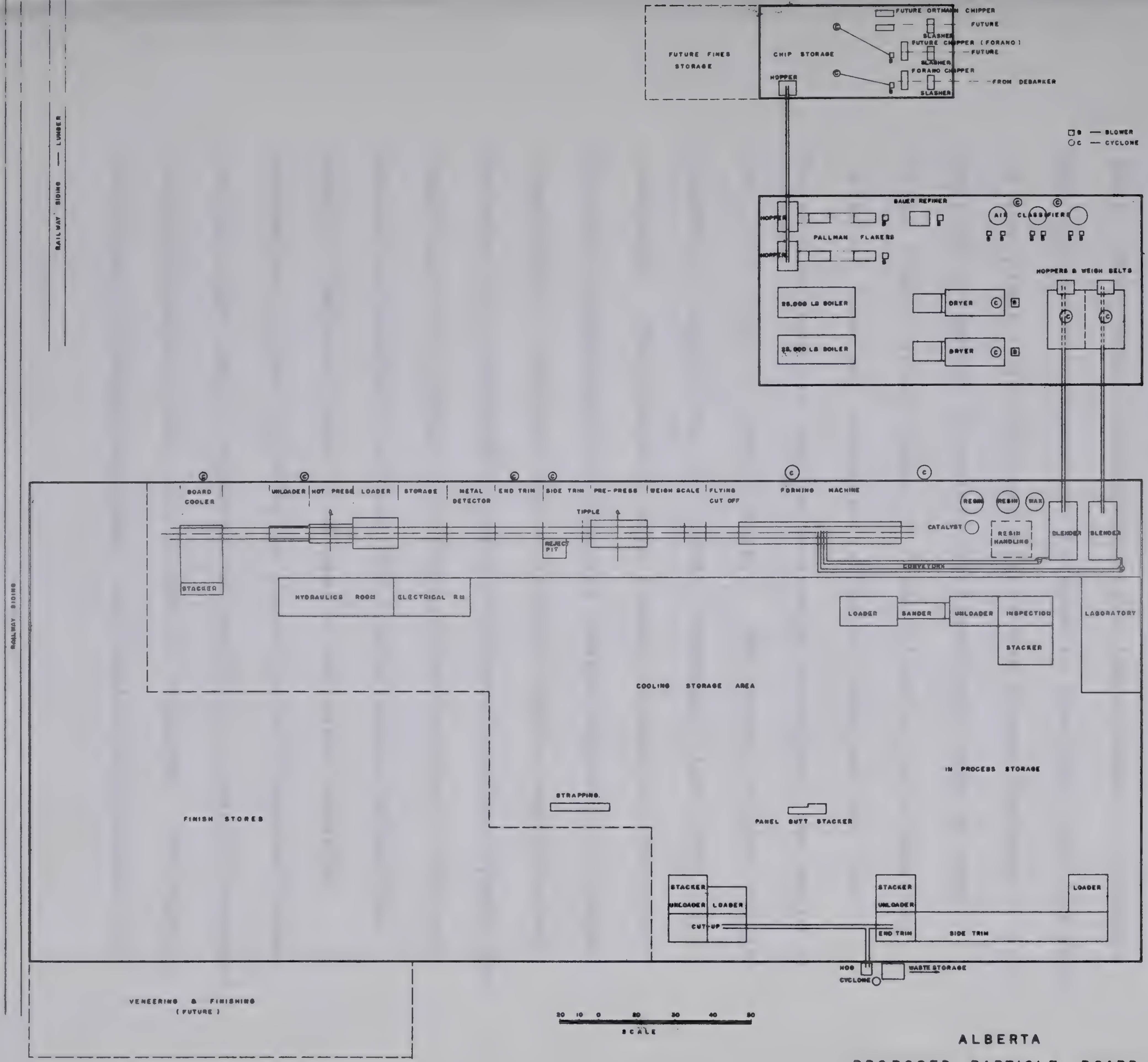
The particleboard plant is best described with reference to the drawing of the proposed plant layout, the process flow chart; the drawing of the equipment layout; and the following section which gives a list of the equipment and estimated capital costs. The equipment list is in

order of the process from start through to shipment of the product. The particleboard plant is contained in three buildings, namely: chipping and chip storage; chip flaking, refining and classifying and drying; particleboard production, finishing, and storage for shipment. The chipping plant is strategically located relative to the debarking plant, sawmill, the semi-dimension plant, and the chip flaking building. This location allows for the efficient design of systems to convey round wood and waste wood to the chip flakers in the adjoining building.

The following process flow chart indicates the flow of material and operations involved in producing the graduated particleboard.

PROCESS FLOW CHART





ALBERTA
PROPOSED PARTICLE BOARD
PLANT

The transport of chips, flakes, and particles up to the forming machine is either by air conveyance or conveyor belt. The former accounts for the large number of blowers and cyclone air separators located in the chip handling area of the plant. The Pallman flaker was chosen because of its ability to reduce a variety of sizes and forms of wood chips into a broad range of flake sizes at an economical ratio of tons per horsepower-hour or tons per man hour. These machines are used extensively throughout the world in the production of particleboard. The Bauer refiner was included to supply the additional necessary fines for board surfacing. The blenders were chosen because of their additional suitability in blending resins and wax with wafer type chips. The Bahre Bison forming machine was selected because it is designed to produce a true graduated particleboard and will produce a waferboard and because it has operated successfully in over 300 installations around the world. The main press line uses a caul-less conveyor system and allows for shorter press cycles, improved pressing accuracy and is reported to result in a quality standard not attainable by the caul system it replaces. The sanding and other finishing equipment was considered a minimum for

this type of plant. All equipment allowed for in the report was selected for its ability to produce the best product at the best possible price.

The cost of an additional 10,000 sq. ft. of building space and allowance of approximately $400,000 were made to cover the cost of a veneering line adequate for overlay with wood veneer 6,500,000 sq. ft. of board per year on a 1 shift basis. Equipment included panel feeder, glue spreader, lay-up table, hot press with loader, unloader, cooling racks, sanding and other finishing equipment, a fork lift vehicle, dust collectors, etc.

The added equipment for flakeboard production includes two Ortmann flakers, additional log and chip conveyor equipment and a separate resin system utilizing phenol resins. An additional warehouse for wood fines storage was included to store the fines which are generated by the Ortmann flakers but which are not used in the production of waferboard. It is intended that the particleboard forming and press line will be adjusted to produce waferboard. The production of this board on a 3 shift basis will be carried out over a 38 day period during the year and will

produce 4,970,000 sq. ft. of board on a 3/4 inch basis. It would be convenient from the standpoint of production, to carry out waferboard production during a period when the sawmill is not in operation. This would avoid the necessity of stock piling waste wood produced by the sawmill and lumber operations during the period that the Ortmann flakers are in operation.

PARTICLEBOARD PLANT CAPITAL COST

The following includes the cost of equipment in the proposed particleboard plant, including the appropriate sharing of certain joint facilities such as the site and development cost, and the cost of fire protection, water and sewer systems.

1. Land and Development

Purchase 55 acres @ $100/ea.	$ 5,500.00	
Clearing @ $300 per acre	16,500.00	
Site Development, grading, roads, etc.	30,000.00	
Rail siding 1,000 ft. @ $5.00 per foot	5,000.00	
Hot pond 40 ft. x 200 ft.	15,000.00	
	$72,000.00	
Allocated to particleboard operation		$57,600.00

2. Outside Protection System

Fire main ring system, 3,500 ft. 8" pressure pipe @ $10/ft., including hydrants and valves	$35,000.00	
Fire pumps - $10,000/ea. installed	20,000.00	
Pump house	5,000.00	
Water reservoir - 600,000 gals.	50,000.00	
	$110,000.00	
Allocated to particleboard operation		$88,000.00

3.	Water supply and treatment (well system)	$20,000.00	
	Allocated to particleboard operation		$15,000.00
4.	Waste Disposal (septic field)	30,000.00	
	Allocated to particleboard operation		25,000.00
5.	Buildings (including heating, lighting, plumbing, insulation)		
	Chipping and chip storage 100' x 50' x 35' high @ $10/sq.ft.	50,000.00	
	Chip flaking, classifying, drying 200' x 100' x 35' high @ $10/sq. ft.	200,000.00	
	Particleboard production, finishing & storage 580' x 250' x 35' high & 24' high @ $10/sq.ft.	1,450,000.00	
	Garage and maintenance 100' x 40' x 10' high @ $4/sq. ft.	19,600.00	
	Sprinkler system @ 50¢/sq. ft.	84,800.00	$1,804,400.00
6.	Power substation - 3250 KVA @ $40/KVA		130,000.00
7.	Steam boilers and accessories		
	2 @ 25,000 lb. ea. (Foster Wheeler)	85,000.00	
	installation	6,000.00	91,000.00
8.	Miscellaneous steam, air, water piping		30,000.00

9.	Air compressor and receiver - 500 cfm. @ $40/cfm.		$20,000.00
10.	Laboratory and communications equipment		20,000.00
11.	Knife grinder and maintenance shop equipment		20,000.00
12.	Office Equipment		10,000.00
13.	Log handling	$51,000.00	
	Allocated to particleboard plant		42,850.00
14.	Debarking Plant	127,030.00	
	Allocated to particleboard plant		106,630.00

15. Production Equipment and Installation

Chip Supply:

	Equipment Cost	Installation	Total Capital Cost
Waste wood conveyors from sawmill and from dimension mill	$ 7,000	–	$ 7,000
Log conveyor from debarker to chipper	5,000	–	5,000
Log slasher ahead of chipper	2,500	500	3,000
Forano 66" 4 knife chipper plus one set of knives	12,600)		13,100
Drive components for chipper including motor	) 7,000)	1,000	7,500
Cyclone chip conveyor system to chip storage	4,000	1,000	5,000
Chip hopper to conveyor	4,000	–	4,000
Front end loader	15,000	–	15,000
Conveyor from chip storage to chip preparation	9,000	–	9,000
			68,600

Chip Preparation:

	Equipment Cost	Installation	Total Capital Cost
Pallman flaker storage bins with variable live bottoms	12,000	–	12,000
4 Pallman flakers Model PZ-12 4 x $21,000	84,000	8,000	92,000
4 Spare knife inserts 4 x 1650	6,600	–	6,600
4 - 75 HP, 1800 rpm motors 4 x 655	2,620	600	3,220
4 x 125 HP, 1800 rpm motors 4 x 1030	4,120	800	4,920
1 knife setting device	640	–	640
Bauer Refiner	25,000	–	25,000
Blower System to Air Separators	10,000	–	10,000
3 Bauer Specific Gravity Separators Model 308-5B 3 @ 5940	17,800	1,500	19,300
3 - 60 in. cyclones 8,000 cfm	12,000	3,000	15,000
2 - Heil Dryers	85,460	8,000	93,460
Blowers - dryers to surge tanks	10,000		10,000
Two conveyors, surge tanks, conveyor weigh scales	20,000	10,000	30,000
Fines Blower	3,000	–	3,000
Resin and Wax Storage, piping, mixing and controls	30,000	5,000	35,000
			$360,140

Blending and Forming

	Equipment Cost	Installation	Total Capital Cost
2 Surge Bins			
2 Bahre Bison Blenders			
Conveyors between blenders and former	$416,000		
Flexible caul system			
Flying cut-off			
1 Bahre Bison former			
Weigh Scale	8,700		
1 Prepress - Washington Iron Works 3450 ton press 450 psi. 15 second cycle 66 in. x 230 in. platen size adequate for 16 opening hot press. Includes all motors, pumps, tanks, controls, operating panel	180,000	$100,000	
Side trim saws & conveyor	9,000		
End trim saws and conveyor	26,000		
Metal detector & conveyor	13,000		
Mat storage conveyor	6,500		
Tipple conveyor	9,000		
Auger conveyor waste material	8,000		
10 opening caul-less press loader Washington Iron	125,000		
10 opening 5 ft. x 18 ft. Hot Press - Washington Iron Works	400,000		
Complete with pumps, piping, surge tanks, etc.			
Electric drives and controls	80,000		
10 opening press unloader	28,000		
Ejector conveyor	4,300		
Board cooler transfer conveyor	7,000		
Auxiliary instrumentation, motors, consols	43,000		
			1,463,500
Board Cooling:			
Cooler transfer conveyor	6,700	2,000	
Board Cooler	11,500		
5 Belt discharge conveyor	4,300		
			24,500

Board Finishing:

	Equipment Cost	Installation	Total Capital Cost
4 belt Sander Tidland 470	87,000	4,000	91,000
Infeed Conveyor	5,200	1,000	6,200
Outfeed conveyor	11,000	2,000	13,000
Panel grading	23,000	2,000	25,000
Panel stacker	10,000	1,000	11,000
Panel sizing	100,000	10,000	110,000
Cut up saw	29,000	3,000	32,000
Finish panel stacker	29,000	1,000	30,000
Exhaust systems	30,000	--	30,000
Hog & conveyor	10,000	2,000	12,000
Refuse blower system	12,000	--	12,000
			372,200

16. Miscellaneous Equipment

Walkway platforms supports	20,000	-	20,000
Electric panels, starters, etc.	150,000	-	150,000
Monorail over Pallmans	5,000	-	5,000
Miscellaneous blowers and pumps	30,000	-	30,000
3 fork lift trucks @ $12,000	36,000	-	36,000
			241,000

17. Engineering	363,070
18. Allowance for import duty	100,000
19. Freight allowance	250,000
20. Federal sales tax	574,060
TOTAL INTEGRATED GRADUATED PARTICLEBOARD CAPITAL COST	$6,277,550

PARTICLEBOARD PRODUCTION OPERATING COSTS

170 tons per day, 130,800 sq. ft. 3/4" basis per day

22.5 productive hours per day, 250 days per year.

Direct Manufacturing Cost		
Raw Materials		
Roundwood[1]	$ 2,704.41	
Wood Waste[2]	125.00	
Resin[3]	1,768.00	
Wax Size[4]	544.00	
Catalyst[5]	11.00	
		$ 5,152.41
Labour		
Production[6]	$ 881.28	
Maintenance & Custodial[7]	256.86	
Direct Supervision[8]	115.20	
		$ 1,253.34
Utilities		
Natural Gas[9]	$ 198.48	
Electric Power[10]	783.41	
Other Utilities - Water, Sewer[11]	20.00	
		$ 1,001.89
Other Materials		
Maintenance Supplies[12]	$ 588.60	
Packing Materials[13]	128.14	
Factory Supplies[14]	327.00	
		$ 1,043.74
Total Direct Manufacturing Cost		$ 8,451.38
Indirect Manufacturing Cost		
Plant Administration		
Salaries, Office Supplies, etc.[15]	$ 100.00	
Labour Overhead[16]	71.45	
		$ 171.45

Depreciation		
Buildings[17]	$ 484.50	
Equipment[18]	1,542.00	
		$ 2,026.50
Municipal Taxes		
Property[19]	$ 173.20	
Business[20]	95.38	
		$ 268.58
Insurance (Plant & Stock)[21]		
Buildings & Equipment	$ 97.60	
Stock	5.40	
		$ 103.00
Total Indirect Manufacturing Cost		$ 2,569.53
Total Direct and Indirect Costs		$11,020.91
Losses due to Damage, Grade Reduction, etc.[22]		881.67
Total Manufacturing Cost		$11,902.58
Interest Cost[23]		$ 1,194.00
Total Cost of Production		$13,096.58

1.	Roundwood - 145 cords per day @ $15.00 per delivered cord.	$ 2,175.00
	Yard handling 84% of joint costs	529.41
		$ 2,704.41
2.	Wood Waste - 25 cords per day received from saw mill and planing-semi dimension mill @ $5.00 per cord.	$ 125.00
3.	Resin - 8% content urea formaldehyde resin @ $6.50 per cwt. for 27,200 lbs. per day	$ 1,768.00
4.	Wax - 1% content of microcrystalline wax @ 16¢ per lb. for 3400 lb. per day	$ 544.00
5.	Catalyst - 5% content of ammonium sulphate @ $3.25 per cwt. for 340 lb. per day	$ 11.00

6. Production Labour

- 1 operator for slasher and chipper per shift @ $2.09 per hr.	3 shifts
- 1 attendant at chip storage and flakers per shift @ $2.24 per hr.	3 shifts
- 1 machine operator at former @ $2.75 per hr.	3 shifts
- 1 machine operator at hot press @ $2.75 per hr.	3 shifts
- 1 relief man on press line @ $2.75 per hr.	3 shifts
- 3 forklift operators per shift @ $2.18 per hr.	3 shifts
- 1 sander operator @ $2.30 per hr.	3 shifts
- 2 board graders and inspectors @ $2.33 per hr.	3 shifts
- 2 finishing saw operators @ $2.29 per hr.	3 shifts
- 3 men for strapping and packaging @ $2.02 per hr.	3 shifts

7. Maintenance and Custodial Labour

- 1 steam engineer per shift @ $3.00 per hr.	4 shifts
- 1 chief steam engineer @ $800.00 per month.	1 shift
- 1 water pump attendant per shift @ $2.02 per hr.	4 shifts
- 1 electrician @ $2.56 per hr.	1 shift
- 1 machinist @ $2.76 per hr.	1 shift

8. Direct Supervision Labour

- 1 foreman per shift @ $7200.00 per year.	3 shifts
- 1 laboratory technician @ $7200.00 per year.	1 shift

9. Natural Gas

- peak demand for building heating 40 mcf per hour, estimated annual requirement 145,000 mcf @ 16¢ per mcf -	$23,200.00/yr
- constant demand 21.9 mcf per hour for dryers @ 16¢ per mcf -	$19,700.00/yr
- constant demand 7 mcf per hour for presses, resin preparation, etc. -	$ 6,720.00/yr
	$49,620.00/yr

10. Electric Power

- connected load - 4842 HP
- demand load @ 65% demand factor @ 85% power factor $\frac{.65\times4842\times746}{.85\times1000}$ 2760 KVA
- hours of consumption 22½ x 21 = 473 hrs.
- energy consumed 473 x 2760 x .85 = 1,110,000 KW hrs.

- Demand charge @ 1.20 x 2760 =	$ 3,310.00	
200 x 2760 x 1.5¢ =	$ 8,290.00	
- Energy charge @ 558,000 x 1.0¢ =	$ 5,580.00	
Monthly Power Bill		$17,180.00
Discount for tax refund - 5%		859.00
Particleboard Plant Net Monthly Bill		$ 16,321.00
Particleboard Plant Net Annual Bill		$195,852.00
Particleboard Plant Net Daily Cost		$ 783.41

11. Other Utilities

The estimated cost of operating the water supply and waste disposal facilities is $20.00 per day.

12. Maintenance Supplies Allowance @ $4.50 per m. sq. ft.

13. Based on steel strapping @ 1.33¢ per foot and fasteners at .75¢ per hundred.

14. Factory Supplies Allowance for sandpaper, chipper and flasher knives, etc. @ $2.50 per m. sq. ft.

15. Plant Administration Salaries allow for a plant manager at $15,000.00 per year, a book-keeper at $5600.00 per year and a steno-typist at $3600.00 per year. Also included is an allowance of $3.20 per day for office supplies.

16. Workmen's Compensation is calculated at $1.60 per $100.00 gross payroll with a maximum of $5600.00 for each employee being assessed. The daily cost is - $ 2.28

16. (Cont'd)

Unemployment insurance for those employees subject to the levy, on a daily basis cost -	$ 6.66
Canada Pension Plan employer contributions are daily -	$21.15
Holiday pay for hourly rated workers at 4% of regular earnings costs -	$41.36
	$71.45

17. Building Depreciation based on 20-year life and capital cost of $2,241,000.00

18. Equipment Depreciation based on 10-year life and capital cost of $3,855,015.00.

19. Property Assessment is $727,300.00
Tax rate at 55 mills.
Annual property tax is $43,285.00

20. Business Tax based on 15% of equipment capital cost and 55 mills.
Annual Business Tax is $23,846.00 and assessment is $433,560.00.

21. Insurance based on $1.50 per 3 years per $100.00 invested in building and equipment and $1.75 per 3 years per $100.00 worth of stock.

22. An allowance of 8% is provided.

23. Interest Charges

The interest charges were based on 50% debt financing of capital assets @ 8% and on working capital requirements at an annual rate of 8%, and were arrived at as follows:

Debt Financing 50% of $6,277,550.00 @ 8% =	$251,100.00
Working capital financing as follows:	
1. Log Inventory 8 mos. supply @ $15./cord $362,355.x.08	$28,988.00
2. Operating cost 1 mo. $231,440.x 8%	18,515.00
Total Annual Interest Charge	$298,603.00

ADDITIONAL PARTICLEBOARD FACILITIES
WAFERBOARD CAPITAL COST

130,800 sq.ft. 3/4 inch basis per day

		Instal.	Total
Additional building 100'x60'x35' high @ $10	$30,000		$30,000
Log transfer	1,500	500	2,000
Log conveyor	2,000	-	2,000
Slasher	2,500	500	3,000
Ortmann flakers Blower & cyclone	275,000	20,000	295,000
Reciprocating screen	3,500	1,000	4,500
Conveyor to fines storage	1,500	500	2,000
Conveyor to fines storage	10,000	-	10,000
Surge tanks above dryer	6,000	-	6,000
Ductwork - blower to dryer	2,000	-	2,000
Hopper - fines to conveyor	1,000	500	1,500
Phenol resin storage, mixer, pumping and controls	20,000	3,000	23,000
Engineering			28,575
Allowance for freight			31,950
Allowance for federal sales tax			42,600
Import duty			11,250
Total waferboard facilities capital cost			$495,375

OPERATING COSTS

Direct manufacturing cost		
Raw materials		
Roundwood[1]	$3,079.41	
Resin[2]	1,445.00	
Wax size[3]	544.00	$5,068.41
Labor		
Production	$ 881.28	
Maintenance & custodial	256.86	
Direct supervision	115.20	$1,253.34
Utilities[5]		
Natural gas	$ 198.48	
Electric power	783.41	
Other utilities - water, sewer, etc.	20.00	$1,001.89

Other materials[6]			
Maintenance supplies		$588.60	
Packaging materials		128.14	
Factory supplies		327.00	$1,043.74
Total direct manufacting cost			$8,367.38
Indirect manufacturing cost			
Plant administration[7]			
Salaries, office supplies, etc.		$ 100.00	
Labour overhead		71.45	171.45
Depreciation			
Buildings[8]		$ 454.20	
Equipment[9]		1,804.32	$2,258.52
Municipal Taxes			
Property[10]		$ 175.84	
Business[11]		106.96	282.80
Insurance (plant & stock)[12]	Plant	$ 105.22	
	Stock	6.07	111.29
Total indirect manufacturing cost			$2,824.06
Total direct and indirect costs			$11,191.44
Losses due to damage, grade reduction, etc.[13]			895.32
Total manufacturing costs			$12,086.76
Interest cost[14]			1,273.68
Total cost of production			$13,360.44

[1] Roundwood -

170 cords per day @ $15 each, delivered	$2,550
Yard handling 84% of joint costs	529.41
	$3,079.41

[2] Resin - 5% content of phenol formaldehyde @ 8.5¢ per lb. for 17,000 lbs. per day

[3] Wax size - 1% content microcrystalline wax @ 16¢ per lb. for 3,400 lb. per day.

[4] Direct labour cost is same as for production of graduated particleboard

[5] Utilities cost is same as for production of graduated particleboard

[6] Other materials (maintenance, packaging and factory) cost is same as for production of graduated particleboard

[7] Plant administration cost is same as for graduated particleboard

[8] An extra 3,000 sq.ft. @ $10 per sq.ft. is required and is depreciated over 20 years. Capital cost is $2,271,000

[9] An additional investment of $451,088 in installed equipment is required and is depreciated over 10 years

[10] Property tax is based on assessment of 40% of building value and tax rate of 55 mills

[11] Business tax is based on assessment of 15% of equipment value and tax rate of 55 mills

[12] Insurance is based on $1.50 per 3 years per $100 invested in buildings and equipment and $1.75 per 3 years per $100 worth of stock

[13] An 8% allowance for grade losses, etc. is provided.

[14] Interest cost based on:

50% of capital cost $3,386,463
593,800
$3,980,263 @ 8% = $318,420

VENEERED BOARD-ADDITIONAL CAPITAL COSTS

Building - 10,000 sq. ft. @ $10	$100,000
Estimated basic cost of installed equipment	
Includes hot press, with loader and unloader	200,000
panel feeder	
glue spreader	
lay-up table	
cooling racks	
trim saw and multi-head sander	
wrapping equipment	
forklift	
Freight Allowance	27,000
Federal sales tax allowance	36,000
Engineering	34,725
TOTAL VENEERING FACILITIES CAPITAL COST	$397,725

Because of wide range of price estimates received from veneer equipment manufacturers, the installed equipment cost is set at $200,000.

VENEERED PARTICLEBOARD - ADDITIONAL OPERATING COSTS

26,000 sq. ft. per day 3/4" basis, 250 days per year, 7.5 productive hours per day.

Direct Manufacturing Cost		
Materials		
Veneer[1]	$2,860.00	
Adhesive[2]	78.00	$2,938.00
Labor		
Production[3]	178.96	
Maintenance[4]	22.08	
Direct supervision[5]	22.40	223.44
Utilities		
Natural Gas[6]	5.12	
Electric Power[7]	12.95	18.07
Other Materials		
Maintenance supplies[8]	65.00	
Factory supplies[9]	65.00	
Packaging supplies[10]	26.00	156.00
TOTAL ADDITIONAL DIRECT MANUFACTURING COSTS		$3,335.51
Indirect Manufacturing Cost		
Plant Administration		
Labor overhead[11]		15.64
Depreciation		
Buildings[12] (10,000 sq.ft. add.bldg.)	20.00	
Equipment[13]	119.09	139.09

Municipal taxes (10,000 sq. ft.add.bldg.)			
Property[14]		$ 8.80	
Business[15]		6.60	$ 15.40
Insurance[16]	Plant	7.95	
	Stock	3.04	10.99
TOTAL INDIRECT MANUFACTURING COST			$181.12
Total additional direct and indirect costs			$3,516.63
Losses due to damage, grade reduction, etc.[17]			281.33
TOTAL ADDITIONAL MANUFACTURING COST			$3,797.96
Interest cost[18]			87.27
TOTAL ADDITIONAL COST OF PRODUCTION			$3,885.23

1. An average price of $55.00 per m. square feet is estimated, based on prices of domestic and imported veneers. The quantity required is 13 m.m. sq. ft. since both sides of the particleboard core must be overlaid to prevent warping.

2. 60 lbs. per m. sq. ft. of board extended urea resin @$.05 per lb.

3.	Production labor -	1 forklift operator	@$2.18 per hour.
		2 lay-up men	@$2.22 per hour
		1 press operator	@$2.50 per hour
		2 trim saw operators	@$2.29 per hour
		1 sander operator	@$2.30 per hour
		1 inspector	@$2.33 per hour
		2 men for strapping and packaging	@$2.02 per hour
4.	Maintenance labor-	1 mechanic	@$2.76 per hour
5.	Direct Supervision	1 foreman	@$7,200 per year

6. Natural gas requirement is 4 mcf per hour @16¢ per mcf.

7. Electric power - connected load 150 HP or 131 KVA @ 85% power factor
   - operating load @ 65% = 85 KVA registered demand

- demand charge is $1.20 per KVA registered demand =	$102.00
- energy charge, first KWH per KVA @ 1.5¢ - 85 KVA x85% power factor x 168 hours per month = 12,138 KWH @ 1.5¢	182.07
TOTAL MONTHLY BILL	284.07
Less 5% discount	14.20
Monthly cost of electricity	$ 269.87

8. Maintenance supplies allowance @ $2.50 per m. sq. ft.

9. Factory supplies @ $2.50 per m. sq. ft.

10. Packaging supplies @ $1.00 per m. sq. ft.

11. Labor overhead @ 7% of wages.

12. Building depreciation - additional area 10,000 sq. ft. @ $10 per sq. ft. and use life of 20 years.

13. Equipment depreciation - capital cost of $297,000 depreciated over 10 years.

14. Property tax based on building assessment of 40% of capital value and tax rate of 55 mills.

15. Business tax based on 15% of equipment capital value and tax rate of 55 mills.

16. Insurance based on $1.50 per 3 years per $100 invested in buildings and equipment and $1.75 per 3 years per $100 worth of stock.

17. An allowance of 8% is provided.

18.

50% of added investment	$198,862
+ Added working capital	73,850
	$272,712

Annual interest cost @ 8% of $272,712 = $21,817.

UNINTEGRATED PARTICLEBOARD PLANT

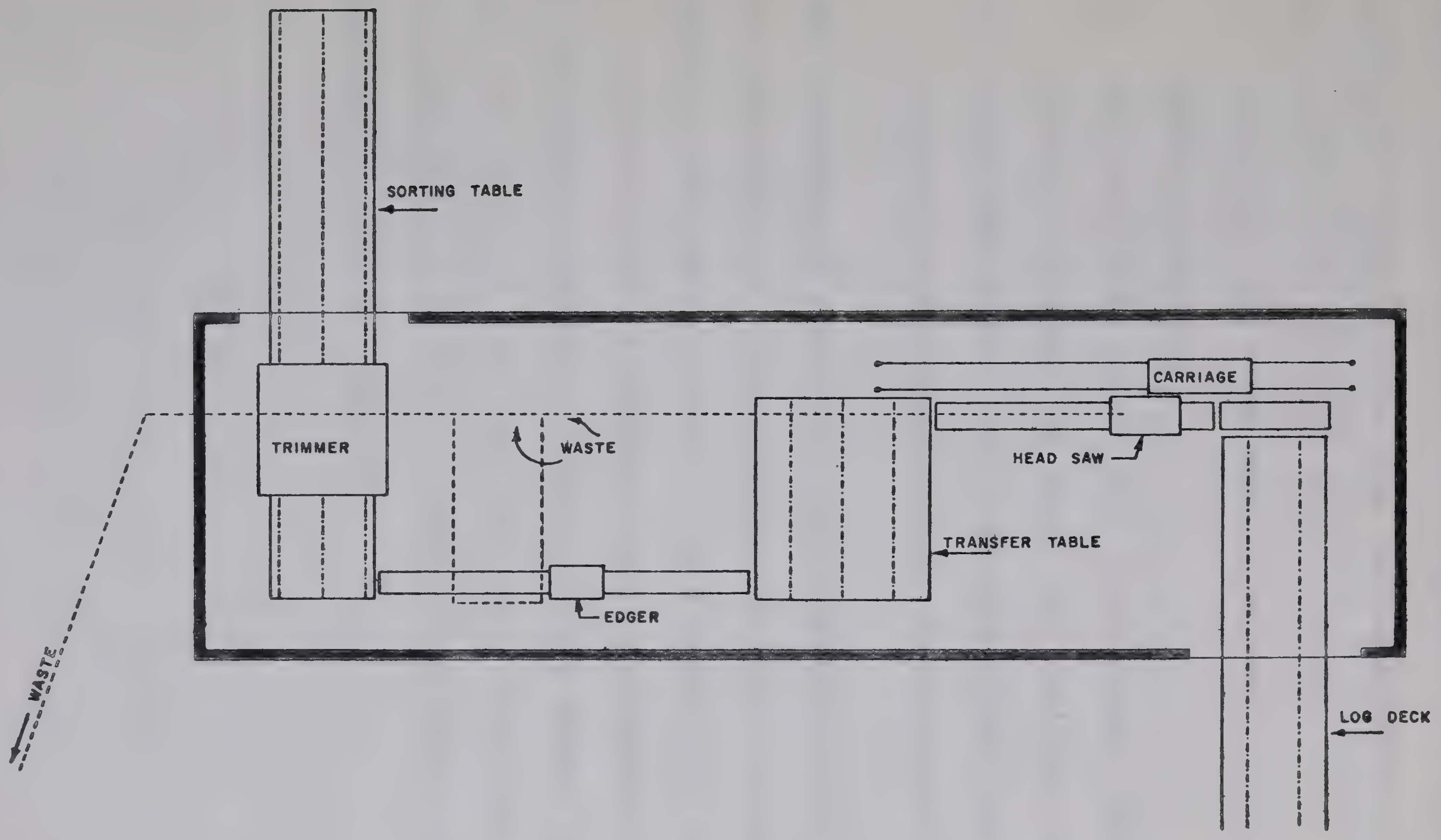
Capital Costs:				
Land, buildings, etc.			$2,535,430	
Equipment			3,817,070	
			$6,352,500	
Operating Costs:				
Raw Materials 170 cords/day @ $15			$2,550.00	
Plus log handling, debarking,etc.			630.25	
			$3,180.25	
Resin			1,768.00	
Wax size			544.00	
Catalyst			11.00	
Total Materials				$5,503.25
Labour				1,383.71
Utilities				1,003.33
Other materials				1,048.14
Total Direct Cost				8,938.43
Plant Adm.				171.45
Depreciation	Bldgs.	507.08		
	Equip.	1,526.83		2,033.91
Mun. Taxes	Prop.	223.08		
	Bus.	125.97		349.05
Insurance	Fixed Assets	122.40		
	Stock	45.50		167.90
Total Indirect Cost				$2,722.31
Total direct and indirect costs				$11,660.74
Losses due to damage, grade reduction				932.86
Total Manufacturing Costs				$12,593.60
Interest Cost @ 8%				1,210.00
Total Cost of Production				$13,803.60
Interest Expense				
Debt Financing - $3,176,250 @ 8%				$254,100.00
Working Capital Financing:				
Operating Cost for 1 month $244,875 @ 8%				$19,590.00
Log Inventory - 8 mos. supply $362,355 @ 8%				$28,988.00
				$302,678.00

LUMBER AND SEMI-DIMENSIONS PLANTS
SAWMILL - DESCRIPTION

Since the initial expected production of 4 million feet per year is not large, the type of equipment suited for a sawmill of this size need not be too elaborate. Since there is a considerable choice in primary breakdown methods the equipment used in the analysis is only a suggested lay out as shown in the following diagram. Corresponding equipment prices were supplied by reputable and experienced sawmill machinery suppliers and builders and are for new equipment. The prices quoted are estimates since actual detailed price quotations will depend on the final choice of equipment, layout, and design of the sawmill. A considerable saving may be expected in the purchasing of good used mill equipment.

The probable production of this type of mill should average 20 - 25 M fbm per shift.

At an average production of 20 M fbm per day the sawmill will produce a surplus of 600 M fbm over the required 4 MM fbm per year. Also, the average daily production figure is a conservative one and, in fact, could exceed 20 M fbm per day.



SAWMILL LAYOUT

SCALE — 1 inch to 20 feet

SAWMILL - CAPITAL COSTS

The following list of equipment is for a sawmill with an average output of 20 - 25 f.b.m. per shift.

(i) Equipment	Cost	
Log receiving and head rig assembly		
- Live log deck - electric - 5 P.H.	$ 2,500	
- Combination log turning deck, log stop and loader - air operated	4,000	
- Remote control carriage, automatic setworks (complete)	12,000	
- 52 inch circulat head rig - electric - 150 H.P.	8,000	
- Automatic Off-Bear Belt - electric and air - 5 H.P.	1,500	
- Transfer to Edger - electric - 2 H.P.	1,800	
- Edger - 3 saw, 1 fixed, 2 hand-set - 4 inch capacity - 60 H.P.	7,500	
- Transfer to Trimmer - electric - 3 H.P.	1,800	
- Trimmer - 2 saw - 15 H.P.	2,500	
- Green chain - 5 H.P.	2,000	
- Air compressor (100 cu.ft. per min. capacity) 30 H.P.	3,500	
- Waste conveyor - 150 ft. - 15 H.P.(2)	15,000	
- Saws, filing equipment, misc. tools, etc.	3,000	$65,000

(ii)	Freight (estimated)	$4,000	
(iii)	Installation (estimated)	25,000	
(iv)	Engineering Design (estimated)	6,500	
(v)	Electrical Installation		
	- Estimate includes wiring, hook-ups and controls (approx. $45 per installed H.P.)	13,725	
(vi)	Land and Development	7,200	
(vii)	Water Treatment and Waste Disposal	5,000	
(viii)	Building and foundations		
	- Butler building all metal construction plus foundation; size - 40 ft. x 140 ft. = 5,600 sq. ft. at $4.90 per sq.ft.	27,440	
	- Sprinkler system	3,400	
	- Electrical lighting (estimated)	5,000	
	- Outside fire protection	3,600	
	TOTAL CAPITAL COST		$165,965

Lumber Handling

Capital Costs

At least one lumber stacker will be required for lumber handling. This machine will transfer lumber from the sawmill to the storage yard, load and unload kiln trucks, and deliver the dried lumber to the planer and storage. A machine similar

to a Patrick rubber-tired, four-wheel drive, Hydro-stack would be suitable with a capital cost of $14,500. Freight charges are estimated at $500. bringing the total capital cost to $15,000.

Dry Kiln

Description

After discussion with several hardwood manufacturers, a six day drying schedule was assumed for drying green poplar lumber to a moisture content of 6 to 8 percent.

A 68 foot double track kiln with approximately a 90 M. f.b.m. capacity should be sufficient to handle the anticipated production.

The capital cost of a 68 foot all-aluminum, prefabricated kiln supplied by Moore-Canada including freight, installation, erection and all necessary equipment except ties, power and water hookup to the control room is in the order of $76,000. This would be a gas fired or high pressure steam kiln. It was estimated that ties, power and water hookup would cost $4,000 bringing the total capital cost to approximately $80,000.

A savings in capital cost in the order of $16,000 might be realized by using an 8 inch cement block kiln structure.

For the purpose of this analysis an aluminum, prefabricated, natural gas fired kiln was assumed.

Dry Kiln

Capital Cost

Dry kiln - 68 foot all-aluminum Moore-Canada prefabricated 90 m. fbm. capacity	$76,000
Installation	4,000
Sprinkler	2,060
Outside fire protection	2,260
	$84,320

Planer Mill

Capital Costs

Although the planing operation and the cut-up-line (components) are shown as one unit in the following layout plan, they were treated as separate entities in the analysis to arrive at production costs for each phase.

The following is a suggest list of equipment required for the planing operation.

(i) Equipment	
- Planer - 20 M f.b.m.per shift capacity - 55 H.P. plus conveying and sorting chain	$25,000
- Conveyor (shavings) - 7½ H.P.	7,500
- Miscellaneous tools, cutter knives, etc.	2,000
(ii) Freight (estimated)	1,000
(iii) Installation and Design	5,000
(iv) Electrical hook-up and controls - ($45. per H.P.)	2,475
(v) Building and Foundation	
- Butler - all metal,	
- Construction plus foundation: size 80 x 100 = 8,000 sq. ft. @ $4.90 per sq. ft. (Note: Building to house planer and provide storage for lumber)	39,200
- Electric Lighting (Estimated)	5,000
TOTAL CAPITAL COST	$87,175

Semi-Dimension Stock Plant

Description

The type of equipment suggested for the cut-up operations is capable of producing the basic shape component, that is, a

component rectangular in cross-section, of a specified length, planed but still requiring final sizing, shaping, etc. Any further manufacturing such as drilling, mortising, tenonning, etc. would require the use of additional, more sophisticated machinery and would result in increased component value. For the purpose of this study, however, only the basic shape component was considered. To include manufacturing beyond this basic shape would require considerably more knowledge of the orders being filled.

In selecting the type and number of machines required to produce 2 million board feet of components annually, average machine production figures were used. Machine production will vary, in fact, depending on the operators' skill and the size of pieces being cut.

Another point worth mentioning is that of quality control in manufacturing. Discussion with a west coast component manufacturer indicated that quality control was the responsibility of each machine operator. With close supervision, both quality and production can be maintained at an acceptable level.

There are two basic approaches that can be taken in the production of component parts. They differ mainly in the method of sizing to thickness and cutting out defective lumber. Very briefly they are:

1. Lumber, planed to thickness, passes through a gang straight-line rip saw, ripping it to width. Ripped pieces pass cut-off saws where defect is cut out and pieces cut to length. Pieces are then sorted and bundled.

2. Rough lumber passes cut-off saws where defect is cut out and pieces are cut to length. Pieces then pass through a surface master which buzz planes or flattens the underside - then to a thickness planer which thickens the piece (material still in board width). Pieces then pass through straight line, single cut rip-saws where they are ripped for width. Pieces are then sorted and bundled.

There are apparently, two disadvantages in the first approach. First, the material is only thicknessed and not buzz planed which is considered a requirement in good component manufacturing. And, secondly, it is considered by

some manufacturers that the straight-line gang ripping does not give a good enough joint for edge gluing in core stock.

The second approach with the single, straight-line rip saw, although more costly, gives a straighter edge which is more suitable if joints are to be exposed or if material is to be edge glued into core stock.

The best method of eliminating defect, that is, from ripped pieces or from board width, is open for argument.

The approach used in this study might be considered a combination of the two and briefly is as follows:

1. Lumber passes through planer where it is surfaced (Planer mill).
2. Lumber passes through single straigh-line rip saws where it is ripped to width.
3. Ripped pieces pass cut-off saws where defect is cut out and pieces cut to length.
4. Pieces pass through surface master (buzz planed) and then through thickness planer.
5. Pieces conveyed to sorting table where they are sorted and bundled ready for shipment.

The planer operation (Item No. 1 above) was included in the overall operation along with the surface-master and thickness planer in the cut-up-line to allow for the possible sale of planed lumber. In practice, the lumber need not pass through both planing operations unless final sizing is required to a more exact thickness.

For the purpose of this anlaysis, it was assumed that all lumber was planed as in Step 1 and further surfaced in the cut-up-line.

Since machine production will vary considerably, depending on the size of pieces being cut and the operators' skill, a reliable estimate of production is difficult to determine.

For the purpose of this study a production figure of 1,500 f.b.m. per shift of components stock was assumed for each cut-off saw. Although this production figure appears quite low it was the approximate production of cut-off saws in a plant manufacturing components visited on the west coast. Equipment suppliers estimate that approximately 1½ single cut, straight-line rip saws are required per cut-off saw.

It is further assumed that the component plant will be operated 2 shifts (16 hrs.) per day for 230 days per year for a total annual production of approximately 2,000 M f.b.m.

Capital Costs

(i) Equipment	
- Single cut straight line rip saws - 15 H.P. each (4 @ $7,000 each)	$28,000
- Cut-off saws - 7½ H.P. each - (3 @ $2,000 each)	6,000
- Surface Master - 25 H.P. each - (2 @ $12,000 each)	24,000
- Thickness planer - 25 H.P. each - (2 @ $12,000 each)	24,000
- Conveyors - 5 H.P.	10,000
- Sorting Table - 1 H.P.	12,000
- Knives, saw blades, filing equipment, miscellaneous tools and equipment (strapping)	10,000
- Medium size lift truck	10,000
- Small lift truck	5,000
- Waste conveyor - 7½ H.P.	7,500
TOTAL	136,500
(ii) Freight (estimated)	5,000
(iii) Installation (estimated)	10,000

(iv)	Engineering Design (estimated)	$ 6,000.00
(v)	Land and Development	7,200.00
(vi)	Electrical Hook-up @ $45 per H.P.	8,820.00
(vii)	Outside fire protection	16,140.00
(viii)	Building and Foundations	
	- Sprinkler system	15,740.00
	- Butler building all metal construction, reinforced concrete floor; size - 100 ft. x 180 ft. = 18,000 sq. ft. at $4.90 per sq.ft.	88,200.00
	- Building Insulation (estimated)	6,000.00
	- Electrical lighting (estimated)	15,000.00
	- Heating system	12,000.00
(ix)	Water Treatment and waste disposal	5,000.00
	TOTAL CAPITAL COST	$ 331,600.00

LUMBER AND SEMI-DIMENSION STOCK MILLS
OPERATING COSTS

SAWMILL

(i) Insurance

Insurance rates on building and equipment are $1.50 per $100 value for 3 years. Insurance costs for the sawmill are then $734.00 per year.

Inventory insurance rates are $1.75 per $100 value for 3 years. Yearly insurance costs are based on one month's production of sawn lumber valued at $52.00 per M b.f.m. Annual insurance costs for lumber inventory are $101.

(ii) Power

Power costs are estimated at $8,850.00 per year.

(iii) Labour

Labour costs for sawmilling are based on 5 men at $11.11 per hour. Total estimated labour costs are $22,896.50 per year including 12 percent for fringe benefits.

(iv) Machine repairs and supplies at $1.20 per M f.b.m. are $4,800. per year.

Sawmilling Cost Summary	Cost per year
Depreciation - Equipment @ 10%	$ 9,735.00
Depreciation - Buildings @ 5%	3,430.00
Insurance	770.00
Machine repairs and supplies	4,800.00

Power	$ 8,850.00
Labour	$22,896.00
TOTAL	$50,481.00

Average milling cost based on 4 MM f.b.m. per year is $12.62 per M f.b.m.

Sawmill - Waste Revenue

Since all sawmill waste (slabs, edgings, trimmings, etc.) are to be used in particle board formation, a value of $5.00 per cord (85 cu. ft.) has been assigned.

Using a conversion factor of 6 f.b.m. per cubic foot (i.e. 50 percent of solid wood is lumber), 50 percent of the solid wood volume consumed in the sawmill should be suitable for chipping.

On an estimated yearly consumption of 7,820 cords, approximately 3,910 cords will be chippable waste. Valued at $5.00 per cord gives a yearly value of $19,550. This revenue reduces the total yearly sawing cost to $30,931. or $7.73 per M f.b.m.

Dry Kiln

(a) Drying Time Required

Drying Schedule	6 days
Kiln Capacity	90 M f.b.m. (approx)
No. of drying days required	270 days (approx)

(b) Fuel Supply and Cost

The moisture content of aspen and cottonwood in green condition varies considerably, but will range from 107 to 123 percent plus, based on oven dry weight. The weight of one thousand actual board feet of lumber is approximately 4,200 pounds in green condition and 2,100 pounds dried to 8 percent moisture content. Therefore, roughly 2,100 pounds of water must be removed per thousand board feet in the drying process.

The following is an estimate of the amount of fuel required and the resulting cost of drying 4 million f.b.m. to 8 percent moisture content.

- 3,000 B.T.U.'s required to evaporate 1 pound of water from wood.
- 6.3 million B.T.U.'s required to dry 1 M f.b.m. to 8 percent M.C.
- 1 cu. ft. natural gas - 1,000 B.T.U.'s.
- 6,300 cu. ft. of natural gas required to dry 1 M f.b.m. to 8 percent M.C.
- fuel cost - 16¢ per 1,000 cu. ft.
- cost of fuel per M f.b.m. = $1.01

The total yearly fuel cost would then be $4,040.00.

(c) Power

Power costs are estimated at $2,320.00 per year.

(d) Labour

It is assumed that one kiln operator will be employed at $2.17 per hour or $4,471.20 per year (includes 12 percent fringe benefits).

(e) Fire Insurance

Insurance rates are $1.50 per $100 value for three years. Annual insurance costs are then $400.

Kiln Drying Cost Summary		Cost per year
Depreciation	- Kiln @ 10%	$ 8,000.00
	- Sprinkler & Other Services @ 5%	216.00
Fuel		4,040.00
Power		2,320.00
Labour		4,471.00
Insurance		400.00
TOTAL		$19,447.00

Kiln drying cost per year is $4.86 per M f.b.m.

Lumber Handling

The following yearly costs are based on one 8 hour shift per day and 230 days per year.

Lumber Handling (Cont'd)

Lumber Handling Cost Summary	Cost per year
Depreciation (10 percent)	$ 1,500.00
Insurance ($1.50/$100 value for 3 years)	75.00
Fuel, lubricants, repairs tires, etc. (estimated)	3,500.00
Labour (includes 12 percent fringe benefits)	4,492.00
TOTAL	$ 9,567.00

The lumbering handling cost based on a production of 4 MM f.b.m. per year is then $2.39 per M f.b.m.

PLANER MILL

(i) Insurance

Insurance on building and equipment at $1.50 per $100. for three years. Insurance costs are $435.90 per year. The annual cost of inventory insurance is based on one month's production of kiln-dried and planed lumber valued at $69.00 per M f.b.m. Insurance rates are $1.75 per $100. value for 3 years. The annual inventory insurance cost is then $134.14.

(ii) Power

Electrical power costs are estimated at $2,240.00 per year.

(iii) Labour

Labour costs are based on 3 men at $6.58 per hour. Total yearly labour costs are $13,560.80 including 12 percent fringe benefits.

(iv) Equipment repairs and supplies at $0.70 per M f.b.m. are $2,800. per year.

Planing Cost Summary	Cost per year
Depreciation - Equipment @ 10%	$ 4,300.00
- Building @ 5%	2,200.00
Insurance	570.00
Power	2,240.00
Labour	13,560.00
Equipment Repairs & Supplies	2,800.00
TOTAL	$25,670.00

Average planing cost based on 4 MM f.b.m. per year is $6.42 per M f.b.m.

Waste Revenue

The volume of waste from the planing operation is estimated at 10 percent or approximately 392 cords per year. Valued at $5.00 per cord, results in a waste revenue of $1,960.00 per year.

This reduces the annual planing costs to $23,710.00 or $5.93 per M f.b.m.

SEMI-DIMENSION STOCK MILL

(i) Insurance

Insurance charges on building and equipment at $1.50 per $100. value for 3 years are $1,437.50 per year. The cost of inventory or stock insurance is based on one month's production of component stock valued at $285.00 per M f.b.m. Insurance rates are $1.75 per $100. value for 3 years. Annual insurance costs are $276.97.

(ii) Power

Power costs are estimated at $7,250.00 per year.

(iii) Labour

Labour costs are based on 24 men per shift at $53.05 per hour. Total estimated labour costs are $218,650.88 per year including 12 percent for fringe benefits.

(iv) Machine Supplies and Repairs

Equipment supplies and repairs are estimated at $4.00 per M f.b.m. or $8,000. per year.

(v) General Supplies

The cost of miscellaneous supplies such as metal strapping, wrapping material (polyfilm) and pallets (palletized loads) is estimated at $10.00 per M f.b.m. or $20,000. per year.

Component Manufacturing Cost Summary	Cost per year
Depreciation - Equipment @ 10%	$15,450.00
- Buildings @ 5%	8,500.00
Insurance	1,714.00
Power & Lighting	7,250.00
Heating (Steam)	1,800.00
Machine Repairs & Supplies	8,000.00
General Supplies	20,000.00
Labour	218,651.00
TOTAL	$281,365.00

Component manufacturing costs based on 2 MM f.b.m. per year is $140.68 per M f.b.m.

Waste Revenue

Fifty percent of the waste material or approximately 1,961 cords per year is suitable for particle board formation. This waste, valued at $5.00 per cord or $9,805.00 per year reduces the total yearly manufacturing costs to $271,560.00 or $135.78 per M f.b.m.

SUMMARY OF CAPITAL AND OPERATING COSTS

The following data presents a summary of costs incurred in production of semi-dimension stock.

SUMMARY CAPITAL AND OPERATING COSTS (Cont'd)

Capital Costs

Log Handling	$ 8,150.00
Debarker	20,400.00
Sawmill	165,965.00
Dry Kiln	84,320.00
Lumber Handling	15,000.00
Planing & Storage	87,175.00
Cut-up-line	331,600.00
Total Capital Cost[1]	$712,610.00

Operating Costs

Direct			
Wood - 7820 cds. @ $15.00 ea.	$117,300.00		
Less revenue from waste	31,315.00		
		$ 85,985.00	
Labour -		274,471.00	
Power, fuel & supplies		71,480.00	
Total Direct Costs			$431,936.00
Indirect			
Management		$ 10,000.00	
Depreciation		61,461.00	
Municipal Taxes[2]		9,680.00	
Insurance		4,333.00	
Total Indirect Costs			$ 85,474.00
Total Direct and Indirect Costs			$517,410.00
Interest Charges[3]			34,227.00
Total Annual Cost of Manufacturing			$551,637.00

1. Includes share of capital costs for site, site preparation, fire protection, utilities, etc.

2. Based on property assessment of $125,000.00 and business assessment of $51,000.00 @ tax rate of 55 mills.

3. Based on: 50% debt financing of fixed assets $356,305.00.

Working Capital

Log Inventory (8 mos.' supply)	$ 78,000.00
Lumber Inventory (1 mo.'s production)	35,000.00
Accounts Receivable	65,000.00
Start-up Loss	10,000.00
	$544,305.00

@ 8%, Interest Expense is $34,227.00

APPENDIX

APPENDIX 1

The sawmill equipment suggested in the report is basic to most sawmills. It is automated to some degree to reduce labour costs but is probably the minimum required for any modern sawmill. A lower cost mill with simpler but basically the same type of equipment, housed in a cheaper structure could likely produce the volume at a lower cost. It would not, however, offer satisfactory working conditions, a similar quality of manufacturing, or the potential for increasing production.

The major problem of setting up a component plant relates to the sawmill. Modern log break-down equipment with reasonable automation and precision is designed for lumber production volumes greater than 4 MM f.b.m. per year. To use more primitive equipment and housing would reduce precision and working conditions below acceptable standards.

Although this investigation used minimum equipment for all phases, the sawmill, planer, and dry-kiln are still of greater capacity than the indicated requirements.

The proposed plant could maintain a production of 3 M.M. f.b.m. of semi-dimension stock and 2 MM f.b.m. of air-dried lumber. The sale of any dimension lumber at a price of approximately $60. f.o.b. mill would recover the cost of producing this item.

The study showed that a 7% return on investment could be expected from the production of 2,000,000 f.b.m. of poplar semi-dimension stock with the operation integrated with a particleboard mill.

1. The high unit cost of production was largely due to the low level of annual output. Increasing lumber production either on a single shift basis or by double shifting the operation would reduce costs. If production on a single shift basis could be increased by 25 percent, milling costs would be reduced by roughly $1.50 per M. f.b.m. Double shifting the sawmill, which is common practice in sawmills, to realize an annual production of 8 MM f.b.m. would reduce sawmilling cost to approximately $10.88 per M f.b.m.

2. A reduction in kiln drying costs would be realized by operating at full capacity, that is on a 365 day per year basis. Using the same 6 day drying schedule, production from the kiln could reach approximately 5.5 MM f.b.m. per year for a drying cost of $4.23 per M f.b.m.

3. Double shifting the planer operation for the annual production of roughly 8 MM f.b.m. per year would result in a planing cost of $5.53 per M f.b.m.

4. Doubling production, would result in a lumber cost of approximately $58.51 per M f.b.m. This is on the assumption that all costs up to the sawing stage remain constant and without altering kiln drying costs for the size of kiln required to dry 8 MM f.b.m. per year. Revenue from the additional waste material would further reduce lumber costs to roughly $53.13 per M f.b.m.

5. Increasing component production by 50 percent (which could be done by adding a third shift) would result in a total production of approximately 3 MM f.b.m. per year. Allowing reduced lumber costs this would result in a cost of approximately $237. per M for the components. The effect

on net income would be to increase the profit after taxes to approximately $130,000. for a final profit in the order of 14% of total investment.

6. A tariff rate of 12.1% was used in the calculations and relates to the expected level that will exist in 1970. The tariff is scheduled for a reduction to 8.5% by 1972.

APPENDIX 2

ELECTRIC POWER - COST CALCULATIONS

Debarking Plant	122 HP	
Sawmill	305	
Dry Kiln	85	
Planer mill	62	
Component plant	196	
Lighting load (above operations)	100	870 HP
Particleboard production (including chipping)	4387	
Lighting load - particleboard plant	455	4842
Total connected HP		5712 HP

Estimated demand factor 65%

Estimated KVA of billing demand at 85% power factor $\frac{.65 \times 5712 \times 746}{.85 \times 1000} = 3260$ KVA

Debarking Sawmill Dry Kiln, Planer, Lighting @ 8 hrs./day 5 days/wk.
connected load 649 H.P. (including lighting load of 75 HP)

Demand load @ 65% demand factor and @ 85% power factor $\frac{.65 \times 649 \times 746}{.85 \times 1000} =$ 370 KVA

Hours of consumption 8 x 21 = 168 hrs.
Energy consumed = 168 x 370 x .85 = 52900 kwhrs.

Demand charge @ 1.20 x 370 = $ 445	
Energy charge 200 x 370 x 1.5 =$1,110	$1,550
Disconnect for Federal tax rebate @ 5%	77
Debarking, Sawmill, Dry Kiln, Planer, etc. net monthly power bill	$1,473

Component Plant (16 hrs./day 5 days/wk.)

Connected load 221 HP (including lighting load 25 HP)

Demand load @ 65% demand factor
85% power factor $\frac{.65 \times 221 \times 746}{.85 \times 1000} = 126$ KVA

Hours of consumption 16 x 21 = 336 hours

Energy consumed 336 x 126 x .85 = 36,000 kwhrs.

Demand charge @ 1.20 x 126 = $151

	200 x 126 x 1.5¢ =	$378	
Energy charge	10800 x 1.0¢ =	108	$637
Disconnect for Federal Tax rebate @ 5%			32
Component Plant net monthly power bill			$605

APPENDIX 3

LABOUR FORCE AND WAGE RATES

LUMBER AND SEMI DIMENSION MILLS

Current Alberta wage rates were not available at the time of this study. The wage rates listed below for different employees are estimates only. These rates were used throughout the study and may not be entirely correct.

The following is a list of the labour force with corresponding estimated hourly wage rates required per shift of operation:

1. Yard		Hour Rate
Loader operators	(1)	$ 2.24
Scaler	(2)	$ 2.28

2. Debarking		Hour Rate
Debarker operator	(1)	$2.22
Cut-off saw operator	(1)	$2.14
Pond man (Jackladder)	(1)	$2.10

3. Sawmill		
Sawyer ("A" type First aid Ticket 25¢/hr.)	(1)	$2.68
Edgerman	(1)	$2.24
Trimsaw operator	(1)	$2.09
Lumber pilers	(2)	$2.05

4. Dry Kiln	
Operator	$2.17

5. Lumber Yard

Fork Lift operator	(1)	$2.18

6. Planer Mill

Planer Feeder	(1)	$2.25
Grader-with certificate	(1)	$2.33
Lumber Piler	(1)	$2.00

7. Cut-Up-Line

Line bar resaw (Feeders & tailers)	(8)	$2.12
Trim Saw	(3)	$2.15
Planerman (Surface master, planers - automatic feed)	(1)	$2.25
Sorter, Stacker	(2)	$2.04
Wrapper & Bundler	(1)	$2.10
Lift Truck Operator	(2)	$2.10
Shipper (+ "A" First-Aid)	(1)	$2.31
Millwright (for saw-mill planer mill & cut-up-line)	(1)	$2.75
Superintendent	(1)	$3.00
Filer (saws)	(1)	$2.15
Clean-up man	(1)	$2.02
Electrician	(1)	$2.76
Watchman	(1)	$2.02

SUPPLEMENTARY INFORMATION

Re:

"ALBERTA POPLAR WOOD PRODUCTS INTEGRATED PLANT"

THE 1970 MARKET FOR GRADUATED INDUSTRIAL PARTICLEBOARD

Statistics published by the Department of Commerce concerning materials consumed by manufacturing industries, and statements by industry executives indicate that approximately 30% of total U. S. particleboard production is devoted to industrial use, or in the order of 660 m.m. sq. ft. 3/4" basis in 1970 when the total U. S. market is expected to be 2.2 to 2.5 billion sq. ft. A U. S. Department of Agriculture bulletin indicates that the industrial board market in the Central States, comprising North and South Dakota, Nebraska, Kansas, Minnesota, Wisconsin, Illinois, Iowa, Missouri, Michigan, Indiana, Ohio and Kentucky, represents approximately 35% of the total U. S. demand for industrial board. In the Lake States, then, including Minnesota, Wisconsin, Illinois, Indiana, Ohio and Michigan, where the wood using industries are concentrated, the regional market was estimated to be 30% of the national total or 200 m.m. sq. ft. in 1970.

In Canada, with an expected particleboard market of 165 to 170 m.m. sq. ft. 3/4" basis in 1970, it was estimated that approximately 40% of that market will be for industrial board and the remainder will be sheathing and

...../2

underlayment. These estimated proportions were based on the rated capacities of existing plants and reported grades of imported particleboard. In 1970, therefore, demand for industrial board in Canada was estimated to be 65 to 68 m.m. sq. ft. 3/4" basis. The percentage distribution of total materials used by present and potential particleboard consuming manufacturing industries, by province, indicates that 58% is consumed in Ontario, Manitoba, Saskatchewan and Alberta. On this basis, the market for industrial purpose particleboard in these four provinces should be at least 35 m.m. sq. ft. 3/4" basis in 1970.

The estimated distribution of the 1970 market of 235 m.m. sq. ft. 3/4" basis, by province or state, is:

Alberta	2 m.m. sq. ft.
Saskatchewan	.1 m.m. sq. ft.
Manitoba	4 m.m. sq. ft.
Ontario	29 m.m. sq. ft.
Minnesota	10 m.m. sq. ft.
Wisconsin	15 m.m. sq. ft.
Illinois	45 m.m. sq. ft.
Indiana	75 m.m. sq. ft.
Ohio	20 m.m. sq. ft.
Michigan	35 m.m. sq. ft.
	235 m.m. sq. ft.

......./3

Discussions with a cross-section of users and dealers in Canada and the U. S. generally confirm the foregoing conclusions drawn from statistics. Based on these same discussions, it's reasonable to expect that the sales distributions totalling 32.7 m.m. sq. ft., as set out in the feasibility study report, can be achieved by a plant located in Northern Alberta.

Markets for Dimension Stock(1)

The main accessible market for poplar dimension stock is in the mid-west United States (Ohio, Indiana, Illinois, Michigan and Wisconsin). Lumber and dimension stock requirements of the furniture industry in this area were 388,879,000 f.b.m. in 1963. Hardwood dimension stock (including poplar) usage was derived as follows:

Table 1:
Mid-West States, Furniture Industry
1963

	Non-upholstered Furniture	Upholstered Furniture
Value of Furniture Shipments	$334,237,000	$167,619,000
Lumber and dimension stock (Hardwood plus Softwood) requirements / $ of Shipments	.834 fbm	.657 fbm
Requirements of lumber and dimension stock (Hardwood plus Softwood)	279,000,000fbm	110,000,000fbm
Hardwood dimension usage as a % of total (2)	8.8%	20.0%
Hardwood dimension usage	23,800,000fbm	22,000,000fbm
Total hardwood dimension stock usage (all species, 1963):	45,800,000 fbm	

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(1) Source of all figures: "Poplar Wood Products, Supplementary Survey and Report", pages 47, 48, and 49.
(2) U.S.A. average - may vary among regions.

On the basis of interviews with principal distributors in the area, the current market for poplar dimension stock was estimated at 5,000,000 f.b.m., to grow to 8,000,000 f.b.m. by 1970. The share which may be captured by Alberta producers is projected at 2,000,000 f.b.m.

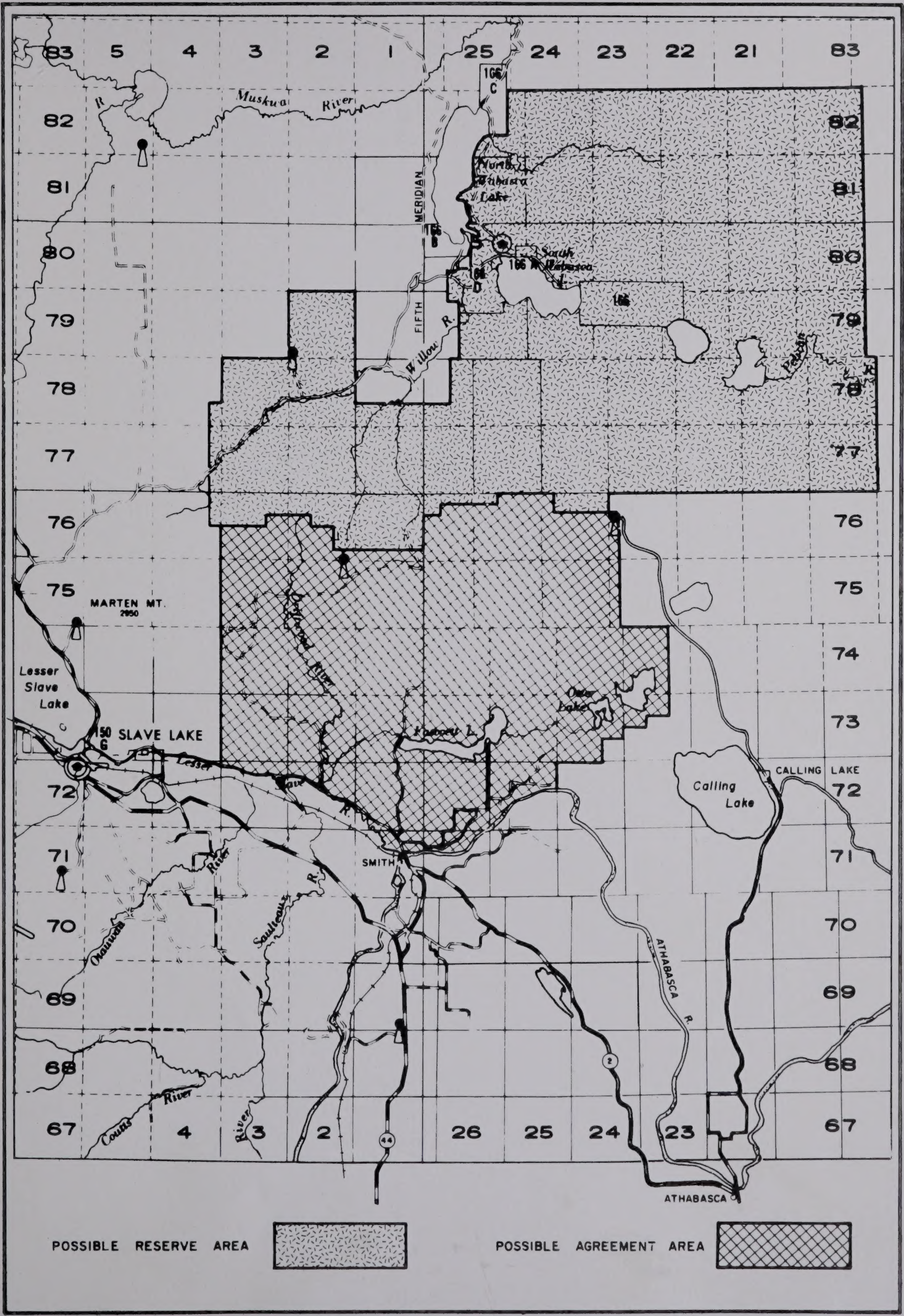
AVAILABILITY OF WOOD SUPPLY

The Poplar Wood Products Report by Underwood McLellan & Associates Limited proposes an integrated operation that would require approximately 45,000 cords of poplar per year.

There is an unlimited volume of poplar in the Slave Lake Forest area and only a small amount has been allocated to existing timber operators. The Government of Alberta amended The Forests Act, 1961, during the last legislature to provide for the sale and allocation of deciduous species in the form of long term quotas. A wood supply for the proposed integrated plant could be made available either through the sale of deciduous quotas or by the granting of a forest management agreement. Both systems would provide a long-term supply to ensure the security of raw material required before investment is made in the plant.

The attached map outlines possible lease and reserve areas that could be provided under a forest management agreement. The lease area contains more than one billion board feet of deciduous trees ten inches diameter at breast height and over. The reserve area contains only slightly less volume. It is difficult to evaluate the degree of utilization of the deciduous stands or the allowance for decay. However a 50% discount of the volume over 10 inches diameter would still provide sufficient wood from each area to operate the mill for 25 years. The lease area could probably sustain the mill's requirements indefinitely by the use of smaller diameters and poorer quality trees and the subsequent use of presently immature stands.

The company that decides to proceed with the integrated plant should contact the Director of Forestry to discuss the alternate methods of acquiring the poplar wood supply.



Muskwa River
North Wabasca Lake
South Wabasca
MERIDIAN
FIFTH
Willow R.
166 C
166 B
166 D
166 A
166
Pelican R.
MARTEN MT. 2950
Lesser Slave Lake
150 G
SLAVE LAKE
Lesser Slave R.
Driftwood River
Fawcett L.
Otter Lake
SMITH
Calling Lake
CALLING LAKE
ATHABASCA R.
ATHABASCA
Saulteaux R.
Otauwau R.
Coutts River
River
2
44
83
82
81
80
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78
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74
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4
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25
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26
POSSIBLE RESERVE AREA
POSSIBLE AGREEMENT AREA